DOCUMENT RESUME

ED 458 348 UD 034 568

AUTHOR	Hafkin, Nancy; Taggart, Nancy
TITLE	Gender, Information Technology, and Developing Countries: An Analytic Study.
INSTITUTION	Academy for Educational Development, Washington, DC.
SPONS AGENCY	Agency for International Development (Dept. of State), Washington, DC.
PUB DATE	2001-06-00
NOTE	143p.; A 16-page executive summary is appended.
CONTRACT	HNE-1-00-96-00018-00
AVAILABLE FROM	LearnLink Project, AED, 1875 Connecticut Avenue, N.W., Washington, DC 20009. Fax: 202-884-8979; e-mail: learnlink@aed.org; Web site: http://www.aed.org/learnlink.
PUB TYPE	Reports - Descriptive (141)
EDRS PRICE	EDRS Price MF01 Plus Postage. PC Not Available from EDRS.
DESCRIPTORS	Access to Education; *Computer Literacy; *Cultural Influences; *Developing Nations; Employed Women; Equal Education; Equal Opportunities (Jobs); *Females; Foreign Countries; *Gender Issues; Governance; *Information Technology; Political Power; Poverty; Sex Role; Sex Stereotypes
IDENTIFIERS	Access to Technology; Globalization

ABSTRACT

This report and executive summary examines the current situation of gender and information technology (IT) in developing nations. The first section describes women as users of IT, producers of IT, and IT decision makers. The second section notes obstacles to women's access (literacy and education, language, time, cost, geographic location, social and cultural norms, and skills) and discusses women's access to IT education and training (studying science and technology, roles in family and society, cost and schooling systems). The third section examines the impact of IT on women's work (women in information and communications technology, the gendered workforce, the impact of globalization on women's work, and trends and issues). The fourth section discusses political empowerment of women through IT (improving governance, IT for the political empowerment of women, education, and indigenous knowledge). The fifth section focuses on ensuring women's ability to take advantage of IT opportunities (engendering IT policy, improving women's access to IT, improving girls' and women's access to education, microcredit, and how poor women can access and benefit from IT). Two appendixes include information technology education and training indicators for women and gender and information technology web resources. (Contains 334 endnotes.) (SM)

Reproductions supplied by EDRS are the best that can be made
from the original document.

ED 458 348

Gender, Information Technology, and Developing Countries: An Analytic Study

Nancy Hafkin
NancyTaggart

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

- ☐ This document has been reproduced as received from the person or organization originating it
- ☐ Minor changes have been made to improve reproduction quality
- • Points of view or opinions stated in this document do not necessarily represent official OERI position or policy

PERMISSION TO REPRODUCE AND DISSEMINATE THIS MATERIAL IN MICROFICHE ONLY HAS BEEN GRANTED BY

R. Peternel

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

2B

UD 034 568

Gender, Information Technology, and Developing Countries

BEST COPY AVAILABLE

LearnLink

Gender, Information Technology, and Developing Countries: An Analytic Study

Moroccan student teachers in Ouarzazate

By Nancy Hafkin and Nancy Taggart
Academy for Educational Development (AED)

For the Office of Women in Development
Bureau for Global Programs, Field Support and Research
United States Agency for International Development

June 2001

ACKNOWLEDGMENTS

This document has been produced under AED's Global Communications and Learning Systems (LearnLink) Project of the Human Capacity Development Center in USAID's Global Bureau, a five-year, Indefinite Quantities Contract No. HNE-1-00-96-00018-00, and Task Order 2432-21. AED acknowledges and thanks USAID's Office of Women in Development for their sponsorship and this opportunity to prepare an analytical study of the gender implications in the spread of information technology.

Also, AED expresses its appreciation to Cisco Systems and the Cisco Learning Institute for their support of AED's research on women in technology training. AED gathered much of the data on information technology education and training included in this paper as part of a project funded by the Cisco Learning Institute entitled *Support for Gender Strategies in the Cisco Networking Academy Program*, Contract No. 12-2789.

The following persons are recognized for their contribution of photographs for the paper:

- Sergio Aranda (photo on page 48)
- Sonia Arias (photo on page 63)
- Sabina Béhague (photo on page 71)
- CATT-PILOTE staff (photo on the cover and page 88)
- Mary Fontaine (photos on the inside cover and pages 18, 35, and 53)
- Nancy Hafkin (photo on page 73)
- Linda Leonard (photo on page 97)
- LTNet staff (photos on page 12 and 67)
- Glenn Strachan (photo on page 43)
- Photographer, unknown (photo on page 83)
- Frederick Wamala (photo on page 23)

Finally, thanks go to the team of LearnLink staff and readers that worked diligently to finalize production copy.

Table of Contents

ACKNOWLEDGMENTS ii

EXECUTIVE SUMMARY 1

INTRODUCTION 1
THE CURRENT SITUATION OF GENDER AND INFORMATION TECHNOLOGY IN DEVELOPING COUNTRIES 1
USES 1
OBSTACLES TO WOMEN'S ACCESS 2
Impact of Information on Women's Work 2
Economic Empowerment through Information Technology 3
WOMEN'S POLITICAL EMPOWERMENT THROUGH IT 4
ENSURING WOMEN'S ABILITY TO TAKE ADVANTAGE OF IT OPPORTUNITIES 5
Policy 5
Infrastructure 5
Education 5
Skills 6
Access for Poor Women 6
CONCLUSION 6

WHY A CONCERN ABOUT GENDER AND INFORMATION TECHNOLOGY IN DEVELOPING COUNTRIES? 9

CURRENT SITUATION OF GENDER AND INFORMATION TECHNOLOGY IN DEVELOPING COUNTRIES 13

WOMEN AS USERS OF INFORMATION TECHNOLOGY 13
Extent To Which Women Are Using New Information Technologies 13
Uses to Which Women are Putting New Technologies 17
WOMEN AS PRODUCERS OF INFORMATION TECHNOLOGY 22
WOMEN AND INFORMATION TECHNOLOGY DECISIONMAKING 22
IMPACT OF INFORMATION TECHNOLOGY ON GENDER ISSUES: TRAFFICKING 24

THE CURRENT SITUATION: OBSTACLES TO ACCESS 27

WOMEN'S ACCESS TO NEW TECHNOLOGY 27
Literacy and Education 27
Language 28
Time 28
Cost 29
Geographical Location 30
Social and Cultural Norms 31
Skills 31
WOMEN'S ACCESS TO INFORMATION TECHNOLOGY EDUCATION AND TRAINING 32
Studying Science and Technology 32
Roles in Family and Society 34
Cost 34

Schooling Systems 35
ACCESS ISSUES: GENDER OR POVERTY? 36

IMPACT OF INFORMATION TECHNOLOGY ON WOMEN'S WORK.....37

WOMEN IN AN INFORMATION AND COMMUNICATION TECHNOLOGY WORKFORCE 37
Gendered Divisions of Labor..... 38
Feminization of IT Occupations 39
IMPACT OF GLOBALIZATION ON WOMEN'S WORK..... 40
Gender Issues in Globalization..... 40
Impact of Information Technology on Women's Work 41
In the Manufacturing Sector..... 41
Changes in the Organization of Work..... 42
The Service Sector 43
The Knowledge-Based Economy 45
Changing Locations of Work: The Informal Sector and the Casualization of Labor..... 46
Teleworking—New Technology in Homeworking 46
TRENDS AND ISSUES..... 47
Lessons for Other Areas 48

OPPORTUNITIES FOR WOMEN'S ECONOMIC EMPOWERMENT THROUGH INFORMATION TECHNOLOGY 49

UTILIZING INFORMATION TECHNOLOGY TO IMPROVE WOMEN'S CURRENT ECONOMIC ACTIVITIES 49
Farmers..... 49
Information Intermediaries 50
Entrepreneurs..... 51
IDENTIFYING OPPORTUNITIES FOR WOMEN IN THE NEW ECONOMY 54
Outsourcing: Teleworking and Teleservices..... 54
Manufacturing 57
E-Commerce 57
IT-Enabled Businesses 59
Core IT Sector Employment 61

POLITICAL EMPOWERMENT OF WOMEN THROUGH IT.....65

IMPROVING GOVERNANCE..... 65
IT and Governance..... 65
IT FOR THE POLITICAL EMPOWERMENT OF WOMEN..... 66
Ending Women's Isolation..... 66
Networking 67
Strengthening Women's Participation in the Political Process..... 69
IMPROVED GOVERNANCE 70
Improved Information Flows and Service Delivery..... 70
EDUCATION..... 71
INDIGENOUS KNOWLEDGE 71
Ongoing Projects 72

ENSURING WOMEN'S ABILITY TO TAKE ADVANTAGE OF IT OPPORTUNITIES 75

ENGENDERING IT POLICY 75

Social Aspects of IT Policy....75
Gender Concerns in IT Policy....77
The Policy Elaboration Process....79
IMPROVING WOMEN'S ACCESS TO IT....81
Public Access Strategies....82
IMPROVING GIRLS' AND WOMEN'S ACCESS TO EDUCATION....83
Generating Demand for IT Education....84
Making IT Education and Training Available to Girls and Women....85
Ensuring that Women Get the Right Skills....87
MICROCREDIT....89
HOW POOR WOMEN CAN ACCESS AND BENEFIT FROM IT....90
Technological Constraints....90
Social and Economic Constraints....92
Ways in Which IT Can Benefit Poor Women....92

CONCLUSION....97

ANNEX I: INFORMATION TECHNOLOGY EDUCATION AND TRAINING INDICATORS FOR WOMEN....99

ANNEX II: GENDER AND INFORMATION TECHNOLOGY WEB RESOURCES....101

ENDNOTES....107

EXECUTIVE SUMMARY

INTRODUCTION

Information technology (IT) has become a potent force in transforming social, economic, and political life globally. Without its incorporation into the information age, there is little chance for countries or regions to develop. More and more concern is being shown about the impact of those left on the other side of the digital divide—the division between the information "haves" and "have nots." Most women within developing countries are in the deepest part of the divide—further removed from the information age than the men whose poverty they share. If access to and use of these technologies is directly linked to social and economic development, then it is imperative to ensure that women in developing countries understand the significance of these technologies and use them. If not, they will become further marginalized from the mainstream of their countries and of the world. It is essential that gender issues be considered early in the process of the introduction of information technology in developing countries so that gender concerns can be incorporated from the beginning and not as a corrective afterwards. Many people dismiss the concern for gender and IT in developing countries on the basis that development should deal with basic needs first. However, it is not a choice between one and the other. IT can be an important tool in meeting women's basic needs and can provide the access to resources to lead women out of poverty.

THE CURRENT SITUATION OF GENDER AND INFORMATION TECHNOLOGY IN DEVELOPING COUNTRIES

Getting reliable statistics on women's Internet use in developing countries is very difficult. The standard indicators are not disaggregated by sex, and the available data are not very reliable or comparable. However, it is clear that the numbers are small and the distribution limited. Most women Internet users in almost all developing countries are not representative of women in the country as a whole, but rather are part of a small, urban educated elite. In many developing countries, less than one percent of the population—male or female—has Internet access. By regions, women are 22 percent of all Internet users in Asia, 38 percent of those in Latin America, and six percent of Middle Eastern users. No regional figures by sex are available for Africa.

USES

Most women in developing countries who use information technology use it at work. Except in upper-income enclaves, home access to a computer and the Internet is not a phenomenon. Users at work generally divide up between those who use it as a tool of production (routine office work, data entry,

manufacturing, computer industry jobs, programming, and related work) and those who use it as a tool of communication (creating and exchanging information). As a tool of communication, the most prevalent application is networking for political advocacy on behalf of women. This came about because the nongovernmental organizations that promoted electronic networking and worked in political advocacy were the early adopters and are continuing users of the technology in developing countries.

Also, developing country women have used electronic communication for networking to promote their business interests. This area is far less developed than that of politically activist networking, but it represents an interesting area with possibilities for further development. E-mail is the major information technology application that women's organizations and individual women in developing countries use. But, time constraints as well as bandwidth limitations make Web use difficult for women.

Few women are producers of information technology, whether as Internet content providers, programmers, designers, inventors, or fixers of computers. In addition, women are also conspicuously absent from decisionmaking structures in information technology in developing countries.

OBSTACLES TO WOMEN'S ACCESS

A series of factors, including literacy and education, language, time, cost, geographical location of facilities, social and cultural norms, and women's computer and information search and dissemination skills constrain women's access to information technology.

Science and technology education is necessary for women to work in IT at the level of computer programmers, engineers, systems analysts, and designers. Women's low enrollment in science impedes this globally. In developing countries, there is a great deal of variation in the percentages of women in natural sciences, computer science, and engineers. There are indications that young women in developing countries are not as affected as U.S. women by attitudes that computer science is not an attractive field to enter. For example, women comprise between 30 and 50 percent of students in computer science and other natural sciences in a number of developing countries. Africa remains the area of greatest concern, however, as African women have the lowest participation rates in the world in science and technology education at all levels.

Impact of Information on Women's Work

Women tend to be concentrated in end user, lower skilled IT jobs related to word processing or data entry and make up small percentages of managerial, maintenance and design personnel in networks, operating systems, or software. Although IT is a new field, gendered division of labor patterns are already emerging. However, women are making inroads into higher levels of

the IT workforce in Latin America, East and Central Europe, much of Western and South East Asia, and South Africa. Women comprise a significant percentage of software programmers in India and Brazil and at all levels of IT work in Malaysia.

Globalization has had a significant impact on women's work in information technology in developing countries. In the first phase of industrialization in Asia, primarily, and Latin America, secondarily, women found many information technology-related jobs in the assembly of electronics. During the last fifteen years when manufacturing became more automated, greater technical and cognitive skills were required than in the first phase of industrialization, and the number of women employed in information technology manufacturing dropped. Also, the first generation of women workers was and is not being retrained for the new jobs.

While advances in information technology are making many women's manufacturing jobs redundant, it is creating other jobs—largely taken by women in the service industries for information processing, banking, insurance, printing, and publishing where skill requirements are higher than in the first phase of IT manufacturing job creation. Within the service sector, the major employment for women is in information processing jobs, particularly involving data entry. The West Indies and the Philippines were the early leaders in this area, followed by China, India, Singapore, Vietnam, and extending most recently to Ghana and Uganda. Many of the new jobs are in call centers, in Geographical Information Systems, and in software, all of which require higher skill levels than data entry. India and Malaysia have cornered the bulk of these jobs, but they are expanding to other areas as well, notably Togo and Tanzania. The salaries for IT service jobs are generally better than in other locally-available jobs with comparable skill levels. While there has been much discussion about teleworking in developing countries, most of the teleworking jobs in developing countries are actually outsourced, located in commercial areas and not in homes. Also, women have expressed a preference for work near but not in their homes.

Economic Empowerment through Information Technology

Uses of information technology to assist women in their current economic activities, including farming, trade, and entrepreneurship, are detailed in the following sections. For instance, women farmers could greatly increase productivity using information on improved technologies, agricultural inputs, weather and markets. Traders and other entrepreneurs need to find marketing information and disseminate information about their businesses. Schoolgirls from the local communities who generally learn computer skills rapidly could be trained to serve as information intermediaries for the older women.

The new information economy offers many possibilities for new IT-enabled businesses that women could establish or in which they could work. Most numerous are the service jobs outsourced by major corporations in the U.S. and Europe. At the low end of the skill level and largest in number are jobs in data entry and data capture. Software programming, GIS and systems analysis jobs require much higher skills and education, but women are moving into these jobs in several developing countries. While the business-to-consumer e-commerce area has generated a great deal of excitement, it can be a difficult field to enter. Women's handicrafts can find niche markets, but marketing and management skills are needed, and supply and delivery problems must be addressed. Some successful developing country e-businesses have targeted their diaspora markets and taken advantage of local delivery. More profitable opportunities exist for women's small-scale enterprises in business-to-business and business-to-government markets.

IT-enabled communications businesses offer much promise for women entrepreneurs, following the model of Grameen Phone in Bangladesh, *téléboutiques* in Senegal and Morocco, and phone shops in Ghana. Given high demand, low capital and skills requirements, these businesses are within the reach of many women in developing countries, if their country has the necessary enabling environment permitting the establishment of such businesses. Availability of credit, particularly in the form of microcredit, is a necessity for women to enter such businesses. While microcredit is increasingly popular, its availability falls far short of demand.

For employment in core sector information technology jobs, women in developing countries need to acquire the necessary training to move into more technical, better-paying, cognitively oriented jobs. While degrees in science and technology are the entry tickets to the higher end of using and producing information technology, women can master many aspects of computer use and maintenance with much less training, with much of it available outside the formal education system.

WOMEN'S POLITICAL EMPOWERMENT THROUGH IT

IT is a forceful tool to improve governance and strengthen democracy. It is particularly powerful for giving a voice to women who so frequently in developing countries have been isolated, invisible, and without a voice. Information technology can contribute to the political empowerment of women as tools for networking women to perform social and political advocacy, to strengthen women's participation in the political process, to improve the performance of elected women officials, to improve women's access to government and its services, to educate, and to disseminate indigenous knowledge. IT is particularly useful in increasing the transparency of accountability of government—an application from which women can particularly profit. A number of projects for women's political empowerment in developing countries are detailed in the following sections.

ENSURING WOMEN'S ABILITY TO TAKE ADVANTAGE OF IT OPPORTUNITIES

Information technology can offer significant opportunities for virtually all girls and women in developing countries, including poor women living in rural areas. However, their ability to take advantage of these opportunities is contingent upon conducive policies, an enabling environment in their countries to extend communications infrastructure to where women live, and increased educational levels. Out of enlightened self-interest, women in developing countries need to involve themselves in the area of information and communication technology policy and regulation.

Policy

The time is particularly appropriate to ensure the inclusion of gender concerns in national IT policy, as most developing countries are either in the process of or about to start elaborating these policies. The necessity of including social aspects in information and communication policy is underscored, and the gender implications of technical policy areas such as network architecture and deployment and pricing and tariff issues are listed on pages 77 and 78. However, in order to ensure women's ability to take advantage of opportunities presented by information technology, gender and development policy makers need to be sensitized to IT issues. IT and gender policy makers need to enter a dialogue so that IT programs meet the needs of women and so that women-targeted programs contain IT training and awareness. Cross contact is essential for the full realization of the opportunities that IT can present for women in developing countries.

Infrastructure

Increasing women's access to information and communication technologies in developing countries involves increasing availability of communication in areas where women live, since most women in developing countries live in presently underserved areas. Extension of infrastructure, particularly wireless and satellite communications, to rural areas and peri-urban areas is crucial to increasing women's access to information technology. Emphasis needs to be on common use facilities, such as telecenters, phone shops, and other forms of public access in places convenient and accessible to women.

Education

The single most important factor in improving the ability of girls and women in developing countries to take full advantage of the opportunities offered by information technology is education, at all levels from literacy through scientific and technological education. Such improvement requires interventions at all levels of education. First, the concentrated efforts of the past ten years to ensure girls' and women's access to quality basic education

should be continued and strengthened. Technologies could be integrated into girls' education and women's literacy programs to expose girls to new technologies at earlier stages and allow for much-needed integration of these two program areas.

Skills

Beyond access to basic education, girls and women must be equipped with skills to prepare them for a range of roles in information technology as users, creators, designers, and managers. Therefore, efforts should focus on increasing the number of girls and women studying IT-related subjects in formal schooling and seeking IT training outside of school, as well as related areas to help them fully utilize IT skills.

Access for Poor Women

Although to date most of the women accessing information technology have been from the educated elite, poor women in development countries can overcome the constraints that presently prevent their access and can use IT to meet their basic needs and exercise their fundamental rights. Technological and social solutions exist to the constraints that presently keep poor women from using information technology. Most of these solutions have been tested in pilot projects. However, virtually none yet have easily replicable business models. Among the most interesting are those that are underway in India, which has become a hotbed of IT applications to meet the needs of the poor in developing countries. These include projects by SEWA, Gyandoot/Dhar, Tarahaat, and the Indian National Dairy Development Board.

CONCLUSION

The Digital Divide is presently at the center of international development concerns. Following the Okinawa Summit in August 2000, the Group of Eight nations set up a Digital Opportunities Taskforce to work on ways to eliminate the divide. Moreover, the United Nations places access to information technology as the third most important issue facing women globally, after poverty and violence against women.

Given the high profile of this issue, the time is ripe to act to ensure that women in developing countries can enter the information age. Although women in developing countries have had little contact yet with the new technologies, it is clear that there are many opportunities to improve the lives of women and their families. The options offered by information technology have to be seized deliberately because the cost of not doing so is very high. The technology is not a panacea for women's problems in developing countries, since IT can bring threats and challenges along with opportunities. It can even be a tool of sexual exploitation. In general, IT offers many new possibilities that offer women in developing countries a lifeline for economic,

social, and political empowerment. Action and complementary activities are needed to exploit the options, but it will be worth the effort. IT can certainly contribute to finding solutions for fulfilling women's basic needs and access to resources. Also, IT will keep women in the mainstream among those seeking solutions.

> We must recognize that information technology is here to stay. . . . What we have to decide is whether we either play the game and turn it to our advantage or lose out completely.
>
> Fatma Alloo, Founder, Tanzania Media Women's Association in the Society for International Development and UNESCO, *Women in the Digital Age—Using Communication Technology for Empowerment: A Practical Handbook*, p. 14. Rome, 1998.

WHY A CONCERN ABOUT GENDER AND INFORMATION TECHNOLOGY IN DEVELOPING COUNTRIES?

Information technology has become a potent force in transforming social, economic, and political life globally.[1] There is little chance for countries or regions to develop without their incorporation into the information age. More and more, development strategists see the need for developing countries to embrace information technology both as a way to avoid further economic and social marginalization as well as to offer opportunities for both growth and diversification of their economies.[2]

The uneven distribution of these technologies within societies as well as across the world has been termed "the digital divide." It reflects a division between the information "haves" and "have-nots" on many lines that often overlap—within countries by race, ethnic group, class, age, region, and gender; between countries; and globally, between those who have access to abundant information resources and those who do not have this access. Women within developing countries are in the deepest part of the divide, further removed from the information age than are the men whose poverty they share.

The gender gap in the digital divide is of increasing concern; if access to and use of these technologies is directly linked to social and economic development, then it is imperative to ensure that women in developing countries understand the significance of these technologies and use them. If not, lack of access to information and communication technologies becomes a significant factor in the further marginalization of women from the economic, social, and political mainstream of their countries and of the world. Without full participation in the use of information technology, women are left without the key to participation in the global world of the twenty-first century. According to the APC:

> IT [information and communication technologies] will be one of—if not the—major development issues of the coming decades. If women are not actively present at all levels, we will see new forms of marginalization that could undermine other advances made by women in the twentieth century. This implies a crucial challenge to women to take on these issues.[3]

It is essential that gender issues be considered early in the process of the introduction of information technology in developing countries. Despite frequent claims to the contrary, information technology is not gender neutral.[4] Gender needs to be considered at the early stages of the diffusion of IT in order for women to participate fully in their use. Gender influences factors such as income, time constraints, literacy, education, language, and cultural contexts that affect access to facilities, training, and employment in the information technology area. Seemingly gender neutral, national level

decisions about infrastructure can impact gender and affect women's opportunities to use new technologies—including decisions about what systems to put in place (at what cost to the consumer?), which suppliers of communications services (will they have universal service obligations?), and where facilities will be located (will they be available in rural areas?).

These aspects of technology choice impact whether women will have equitable access to the new technologies. At the same time, failing to consider gender issues (such as sexual division of labor, cultural definitions of women's activities, women's paid and unpaid labor, and women's multiple roles) from the early stages of technology diffusion may unwittingly generate unintended negative effects on women. This happened with the Green Revolution where technology and technological change brought significant costs for rural women.[5] In the case of information technology, the potentially adverse impact on gender may be even more pervasive than with the Green Revolution because information technology is a meta-technology that cuts across virtually every economic sector and geographical area.

As with all new historical trends, the advent of information technology has been accompanied by a tremendous amount of hyperbole about its transforming powers. Information technology in itself will not bring about an end to poverty or transform the lives of women in developing countries. At the same time, IT can threaten the livelihoods of women, when, as part of economic globalization, it eliminates the jobs they were performing or puts them in new jobs under harsh conditions and with low pay. It can even be a tool of sexual exploitation. While IT brings threats, it also brings the promise of new and better jobs and businesses, of fuller participation in the political process, of communication with worlds outside the boundaries of home and community, of easy access to information and resources that can change lives, and of the ability to acquire education and skills and to transcend social restrictions—all of which can empower and enhance the quality of women's lives in developing countries.

Taking advantage of the opportunities will also take awareness and action because most women in developing countries have neither the access to the new technologies nor the prerequisites for their use. Programs will have to be designed and put in place that ensure women's access to the technologies that can empower them in many aspects of their lives. As Noeleen Heyzer, Director of the United Nations Development Fund for Women (UNIFEM), has said:

> Information and communication technologies have enormous potential to link remote communities to global markets, to make telemedicine and telework available to communities in need, to democratize decisionmaking, to support distance learning. But if the global community and national policy makers are not proactive about ensuring that the benefits of IT are equally available to and shaped by

> women and men, we will fail to reap the full potential of these powerful tools. [6]

Many critics dismiss the issue of information technology and gender in developing countries because of the more pressing needs that women in developing countries have for safe water, adequate food, improved health, and better education:

> The debate centres on prioritising need: how important is Internet access in an area without safe water or even affordable telephone services? While some health workers praise the satellite system that has brought them e-mail connections and cheap access to health information, others complain that Internet connections will not pay for aspirin or syringes. For . . . schools, the Internet means expanding horizons but others worry that its glamour will undermine education services.[7]

Health, water, food, education, and information technology are not in opposition to each other in the drive to empower women in developing countries. They are all needed. Simply ending the isolation that many women face—in rural as well as urban areas—through improved communications will go far toward promoting economic growth and alleviating poverty. Information technology can be a tool for bringing education and improved health services to women.

There is no longer a choice. The forces of globalization have made this one world and one economy. While there are risks in joining the global information society, the greatest risk of all is in not joining in it. As Fatma Alloo, Founder of the Tanzania Media Women's Association, writes:

> We must recognize that information technology is here to stay. . . . What we have to decide is we either play the game and turn it to our advantage or lose out completely.[8]

The new technologies are a lifeline that can enable women in developing countries to join the battle for economic, social, and political empowerment. Shirley Malcom of the American Association for the Advancement of Science has made the case for ensuring women's access to information technology. According to Dr. Malcom:

> Women must have access to the education and technologies essential for development. . . . The new information and communication technologies have given us remarkable tools to achieve an enhanced vision of inclusive development strategies. These tools, along with an expanded understanding of the power of knowledge, wisely applied, have the potential to transform our rhetoric into reality, our pilot projects into large scale but locally responsive campaigns. . . . We must make the tools of development, of information and connection available to women, as though our world depended on it.[9]

Marie-Helene Mottin-Sylla from the nongovernmental organization ENDA-Dakar argues that information technology can open up a direct window for women to the outside world:

> The freedom to have access to spaces other than the bedroom and the kitchen, and to fully and safely be able to act in other public spaces, is the key to women's participation in the world's future.[10]

This is an unprecedented time to take advantage of the rapid growth and volatility, if not turmoil, of the evolving IT sector to ensure women's participation as users, workers, entrepreneurs, inventors, managers, and policy makers. Interventions to make a place for women in IT can work. It is a time for risk-taking and action in addition to being concerned about equity and the prevention of exploitation.

Brazilian girls accessing English language lessons on the web

There are many aspects to the relationship between information technology and gender in developing countries. The issues of the gender gap in the digital divide and the impact of new technologies on gender, in particular on the economic and political spheres of women's lives, are of major importance. This paper will examine these in depth, concluding with an examination of the opportunities that information technology can bring to women in developing countries and of the ways to ensure that women can take full advantage of these opportunities.

CURRENT SITUATION OF GENDER AND INFORMATION TECHNOLOGY IN DEVELOPING COUNTRIES

In order to describe the situation of women and information technology in developing countries and measure the extent of the gender digital divide, we will look at women's use of new information technologies in developing countries—how many women are using them, who these women are, what they are using them for, and what roles women have within the information technology industry and its governance.

WOMEN AS USERS OF INFORMATION TECHNOLOGY

Extent To Which Women Are Using New Information Technologies

Internet usage is the standard indicator of the use of information and communication technologies. However, it is extremely difficult to get data on use by gender by country for developing countries. The International Telecommunication Union gathers data on Internet use by countries but the data are not sex-disaggregated. The available sources of information include marketing surveys and *ad hoc* research projects that have sex-disaggregated data. From these sources, we have compiled percentages of women who use the Internet in selected developing countries. The figures are shown in a descending order of percentages (Table 1). For comparison purposes, statistics on women and Internet use in the United States are included.[11]

The figures by country are puzzling because there does not appear to be any correlation between women's Internet usage and expected indicators such as female literacy rate, female GDP per capita, female representation in professional and technical jobs, or even gender empowerment. Nor were there regional patterns to women's use. The percentages of women among Internet users in the 19 countries (other than the U.S.) for which data could be found ranged from lows of six and ten percent (Jordan and Lithuania) to highs of over 40 percent (Mexico, Croatia, Brazil, the Philippines, and South Africa). Nor was there any correlation in developing countries between a high percentage of users overall and a high percentage of women users, as there is in the developed world, especially in the U.S. and Japan.

Some of the countries with high percentages of women users are countries where overall users remain limited to a very small elite (between 0.6 and 4.3 percent of the population). But there are exceptions, such as Estonia where 11 percent of the population use the Internet and 38 percent of those users are women.[12] On the other hand, in Slovakia, which also has a high overall rate of usage, only 12 percent of users are women. Among the developing nations, large countries with large absolute numbers of women Internet users are Brazil (1,075,000 women users), China (6,840,000 women users), and

the Russian Federation (4,560,000 women users). Projections indicate that by 2003 there will be nearly 8 million women Internet users in China and nearly 2 million in India. [13]

Table 1
Women's Internet use in selected developing countries and the United States[14]

Country	Women as % of Internet users, 2000	Total women Internet users in '000s	Total no. Internet users in '000s	Internet users as % of total population	Population in '000s	Female prof. & tech. workers % of total	Female literacy rate	Female GDP per capita (US$)	GDI Rank 1/174
U.S.A.[15]	51.1	83,479	170,280	60.0	283,800	53.1	99.0	23,540	3
Philippines	51.0	76.5	150	0.6	77,726	65.1	94.3	2510	65
South Africa	51.0	645.6	1,266	4.2	42,835	46.7	83.2	4637	84
Brazil	43.0	1,075	2,500	2.1	169,807	63.3	83.9	3813	67
Croatia	42.0	63	150	4.3	4,672	n/a	96.4	3557	50
Mexico	42.0	567	1,350	2.5	98,553	45.2	87.9	4594	48
Estonia	38.0	57	150	14.1	1,421	66.8	99	4236	49
Russian	38.0	4,560	12,000	1.8	146,861	n/a	98.8	3503	61
Zambia	37.5	1.13	3	0.2	9,461	31.9	67.5	753	125
Uganda	31.5	4.73	15	0.1	22,167	n/a	35	944	131
China	30.4	6,840	22,500	0.7	1,265,530	45.1	74.5	2485	79
India	23.0	115	500	0.2	983,377	20.5	39.4	902	112
Poland	18.7	295.6	1,581	5.4	38,607	61.2	99	5061	40
Belarus	17.5	14	80	0.1	6,667	38.4	98.5	3909	54
Ethiopia	13.9	0.83	6	0.1	58,390	n/a	29.2	349	172
Slovakia	12.0	60	500	13.0	5,393	59.7	99	6366	39
Czech Republic	12.0	48	400	6.8	10,286	54.1	99	7952	34
Senegal	12.0	.90	7.5	0.3	9,723	n/a	24.8	1253	127
Lithuania	10.0	7.0	70	2.9	3,600	67.5	99	3323	55
Jordan	6.0	3.7	60.8	1.8	4,435	n/a	81.8	1429	n/a
Colombia[16]	n/a	n/a	350	0.0	38,581	45.6	90.8	4725	51
Peru	n/a	n/a	200	1.5	26,111	39.4	83.7	2335	71
Turkey	n/a	n/a	450	2.3	64,567	33	73.9	4681	73
Thailand	n/a	n/a	200	1.3	60,037	54.5	92.8	5000	58
Indonesia	n/a	n/a	300	0.2	212,942	40.8	79.5	2359	88
Pakistan	n/a	n/a	61.9	0.1	135,135	21.0	25.4	701	116
Vietnam	n/a	n/a	10	0.1	76,236	27.6	89	1385	91

Overall, there is no correlation within countries between female literacy and women's Internet use. Countries with nearly universal female literacy are found both near the upper end of percentage of female users (Russia and Estonia with 38 percent each) and near the bottom (Slovakia and Lithuania with only 10 and 12 percent respectively). Nor did Internet use by women correlate with percentage of female technical and professional employment. Countries where women are nearly half or more of this category are found among the high percentages of female users of the Internet as well as among the lowest.

Nor do countries with a high percentage of female users (i.e., those above the median) have a high female GDP. Countries with the highest female GDP per capita on the list are in the lowest quadrant (Czech Republic) among percentage of women users. As noted above, developing countries with high female Internet use have low overall Internet use—only among a small elite. In these countries elite women are well represented. As GDP rises, the overall dominance of men in these societies edges the percentage of female users lower.[17]

Presently Limited to a Small Elite

The lack of correlation of women's Internet use with expected indicators supports the hypothesis that most women Internet users in almost all developing countries are not representative of women in the country as a whole, but rather are presently part of a small, educated urban elite.

Figures of relatively high (e.g., 30 percent or more) women's Internet use as a percentage of total users per country can be misleading when Internet access is confined to a tiny elite of high income urban dwellers. This is the case in the Philippines, where women are 51 percent of total users, but where total users are fewer than one percent of the population. Similarly in Uganda and India women comprise 32 percent and 23 percent of users, respectively, but the overall percentage of the population with Internet access is 0.2 percent or less. The low figures of overall percentage accessing the Internet are striking in comparison to the U.S. where Internet usage now stands at 60 percent of the population, with 51 percent of those users being women.[18] The likelihood of women in rural areas or poor women in urban areas having access to new technologies is low in countries where fewer than 10 percent of the population is connected. Development communication studies have shown that women's organizations in developing countries have little access to communication media beyond radio. They are unlikely to have tape recorders, VCRs, or stand-alone computers, let alone Internet access.[19]

Usage Growth by Regions

Regional figures of Internet use, which are generally compiled by e-commerce marketing consulting firms, are more easily available than country statistics. According to regional statistics, more than 90 percent of Internet users are in industrialized countries, while 57 percent are in U.S. and Canada alone. High current growth rates as well as potential are apparent in Asia, particularly in China and India where growth figures for these countries have overtaken those of Japan. The number of Asian Internet users is growing by 38 percent a year and will be 27 percent (presently they are 21 percent) of the global Internet user population by 2004.[20] Latin America will capture 5.3 percent, and because of its considerably lower starting point, will show the highest growth rates, with Brazil and Mexico taking the lead.[21] High growth rates are also expected in Russia and other transition economies, in particular in

Hungary and Estonia, which are moving forward rapidly. Rapid growth is expected to start in the Middle East as well. The marketing studies have little to say about Africa, particularly subSaharan Africa outside of South Africa, which accounts for fewer than one percent of total Internet users globally but has 13 percent of the world's population.[22]

Regional figures in Asia indicate that 22 percent of users in 2000 were women. For Latin America, overall figures reveal that 38 percent of users were women.[23] In the Middle East, an estimated six percent were women. No regional figures were available by gender for Africa. In the two latter regions fewer than one percent of the total population were connected to the Internet.

Where is the Digital Divide Deepest?

Amidst rosy predictions of increasing Internet use for many developing countries, it is useful to identify the countries that are most removed from the information age—countries where fewer than one percent of the population has access to Internet. Since women's usage is generally below parity in developing countries,[24] it can be assumed that fewer than one percent of women in any of these countries have access to the Internet. These countries are shown in Table 2.

Not surprisingly, the Least Developed Countries remain furthest outside the information loop. No LDC has more than one percent of its population connected to the Internet, and most of the LDCs cluster near the low end of countries ranked by percentage of users of the Internet.

Growth and Expansion

Just as the percentage of women users in the United States has been growing rapidly to the point where women are now a majority of users of the Internet, women's use has been growing in all developing countries. In the last year, the percentage of women users in the Philippines grew from 43 to 51 percent (18.6 percent increase), in Brazil from 25 to 43 percent (52 percent increase), in Mexico from 33 to 42 percent (27.3 percent increase), in Western Asia from 4 to 6 percent (50 percent increase), and in China from to 21 to 30.4 percent (45 percent increase).[25] In the last two years women users increased from 38 to 51 percent of users in South Africa, an annual growth rate of 17 percent. No countries for which data are available show a decrease in women's usage.

Given the general picture of relatively limited access of women in developing countries to IT, the rapidity with which this is changing must be underscored. Women's use is growing rapidly, and in many cases is not captured by inadequate statistics. In addition, as will be described in detail later, many efforts are underway to transcend the obstacles that have constrained women's access. Most of the social and technological barriers have been

breached. With an increase in effort and attention, women's access and use will become more rapid and widespread.

Table 2
Developing countries with less than one percent of population accessing the Internet[26]

Country	Internet users per 10,000 population	Internet users as % of population	Country	Internet users per 10,000 population	Internet users as % of population
D.R. of Congo	0.1	0.00	Zimbabwe	17.4	0.18
Somalia	0.2	0.00	Morocco	17.9	0.17
Liberia	1.0	0.01	Indonesia	19.1	0.18
Ethiopia	1.2	0.01	India	20.0	0.20
Eritrea	1.3	0.01	Philippines	20.56	0.21
Rwanda	1.4	0.01	Kyrgyz Republic	21.4	0.22
Bangladesh	2.4	0.02	Egypt	29.8	0.29
Burundi	3.1	0.03	Dominican Republic	29.9	0.30
Uzbekistan	3.1	0.03	Tunisia	31.7	0.31
Cambodia	3.7	0.03	Honduras	31.7	0.29
Laos	3.8	0.04	Senegal	32.5	0.29
Papua-New Guinea	4.3	0.03	Thailand	33.17	0.33
Madagascar	5.2	0.05	Moldova	34.3	0.34
Yemen	5.7	0.06	Sri Lanka	34.9	0.34
Pakistan	6.0	0.06	Guyana	35.1	0.43
Guinea	6.4	0.07	Namibia	35.4	0.43
Algeria	6.5	0.06	Georgia	36.7	0.40
Albania	6.5	0.07	Paraguay	37.3	0.36
Haiti	7.4	0.09	Ukraine	39.5	0.40
Tanzania	7.6	0.08	Nicaragua	40.5	0.41
Mozambique	7.8	0.08	Bolivia	43.0	0.43
Angola	8.0	0.09	Kazakhstan	43.0	0.42
Mali	9.1	0.09	South Pacific	58.04	0.58
Bosnia-Herzegovina	9.1	0.10	Guatemala	58.6	0.51
Nigeria	9.2	0.09	Jordan	60.8	0.61
Malawi	9.4	0.10	El Salvador	65.0	0.68
Belarus	9.7	0.10	Turkey	67.43	0.67
Ghana	10.2	0.10	Peru	80.65	0.81
Azerbaijan	10.4	0.10	Russia	81.47	0.81
Mongolia	11.5	0.11	Oman	83.96	0.84
Kenya	11.8	0.12	Armenia	85.1	0.88
Uganda	11.8	0.11	Colombia	88.65	0.89
Vietnam	12.7	0.13	Afghanistan	n/a	n/a
Nepal	15.0	0.14	Burma	n/a	n/a
Ecuador	16.1	0.16	Serbia	n/a	n/a
Zambia	16.7	0.15	Tajikistan	n/a	n/a
Benin	16.8	0.15	Turkmenistan	n/a	n/a

Uses to Which Women are Putting New Technologies

The uses to which women are putting new information and communication technologies are determined by the extent to which women access the technologies. The situation is very different in developing countries from that of developed countries. In the United States where 46 percent of homes have Internet access and women have become as connected as men,[27] using the computer has become a home activity that can take up many hours of women's time each week.[28] Women in the U.S. generally use the Internet to

find information that will make their lives easier as well as improve the quality of life for themselves and their families.

Except in upper income enclaves, home access to a computer (and to Internet) is not a phenomenon in developing countries. When women have access, they generally have it at work, and they use it in their work.

> In India all electronic media, ranging from satellite television to e-mail and the Internet, are accessible only to the privileged classes and cater almost exclusively to their predominantly male information and entertainment needs and desires. In Bangladesh, the cost of hooking up to the Internet could feed a family for a year. In the Philippines...an Internet hookup amounting to US$200 is beyond the reach of even the middle class... It is a luxury item for most families and access to it is work-related.[29] The majority of African women have access to IT only at work.[30]

Among users at work, a rough division could be made between those women who use information technology largely as tools of production (routine office work, data entry, manufacturing, computer industry jobs, programming and related work) and those who use IT as tools of communication (creating and exchanging information). In this latter group would be women who work in nongovernmental organizations or academia and at higher levels of work in the private and public sector. There is substantial literature on women's use of information technology as tools of production that will be dealt with under that section below. The discussion of women's uses of information technology in this section will center on its uses as tools of communication.

A businesswoman visits a USAID-supported telecenter in Benin

There are no surveys that document all the uses women make of information technology in developing countries. However, the application that appears most prevalent is networking for political advocacy on behalf of women. This came about because nongovernmental organizations that promoted electronic networking and that worked in these areas were the early adopters of the technology in developing countries. As a result, information technology has already had a substantial progressive social impact in developing countries

and has become identified with the quest for democracy, women's rights, and environmental protection.[31]

The first linkages between gender, information technology, and developing countries began with the work of NGONet in preparation for the 1992 Earth Summit organized by the United Nations Conference on Environment and Development in Rio de Janeiro. NGONet's aim was to give women and other groups from developing countries a chance to use electronic communication to express their views to a global development forum.[32] NGONet inspired the creation of the APC Women's Networking Support Programme (WNSP), which has become the single largest force globally in stimulating the use of information technology on behalf of women's causes in developing countries. APC is a network of Internet providers consisting of or working closely with nongovernmental organizations working on behalf of social justice, with a particular emphasis on women's rights. Created in 1990, its women's program came into existence in 1993, with the impetus of preparing for the Fourth World Conference on Women to be held in Beijing in 1995 and with the rapid development of digitalized information and communication technologies.[33] The APC Women's Programme has the following aims:

> The Women's Programme promotes women's rights and democratic access to new communications technologies and supports the empowerment of their organizations and networks through the incorporation of computer networking as a tool for coordination, expression and access to information. It also aims to increase women's visibility in the field of information technology.[34]

The stimulus of the Fourth World Conference on Women to use information technology was that the Conference invited nongovernmental organizations to contribute to regional plans of action, which would become part of a global *Platform for Action.*[35] This had happened in preparation for previous World Conferences on Women in Mexico City, Copenhagen, and Nairobi (1975, 1980, and 1985, respectively), but by 1995 the increased availability of new information and communication technologies made the regional exchanges of views and inputs possible in a way that was not possible before. The APC Women's Programme not only used the new media for information exchange but also led efforts to get women access to and training in the use of the new technologies. The result was a large surge in activity facilitated by information technology on the part of women's nongovernmental organizations globally. Following the Beijing Conference, these organizations continued their work and have remained participants in the major issues of the day affecting women in their regions.

The networks that coalesced around the Beijing Conference have been active in using information technology on behalf of women's rights in all parts of the world. At the regional level, they include the Network of East-West Women for Eastern and Central Europe, FEMNET in Africa, La Neta and the Women's chnProgramme (*Área Mujeres*) of the *Agencia Latinoamericana de*

Información (ALAI) in Latin America, and the Asian Women's Resource Exchange (AWORC).[36] Although the activities vary considerably from region to region, they all use information technology to facilitate their work. In Zanzibar, the Tanzania Media Women's Association became an e-mail node supporting women's rights.[37] Isis-International-Manila runs the Asia-Women's listserv disseminating information on current issues affecting women in Asia and the Pacific, a web site and an electronic forum called Asia-gendermedia.[38] Women's organizations in Africa have been particularly notable for setting up a number of high quality and information rich web sites: these include ENDA-SYNFEV, http://www.enda.sn/synfev/synfev.htm; Women'sNet, http://www.womensnet.org.za; FamAfrique, http://www.famafrique.org; FEMNET, http://www.africaonline.co.ke/femnet; and Flamme/Flamme, http://www.flamme.org.[39]

Mary Fontaine of AED summarizes the uses women's organizations are making of information technology.

> Today, women's organizations on all continents are starting to take advantage of IT. . . to collect, synthesize, disseminate and, to a lesser but growing degree, produce information. . . . Around the world, NGOs with IT access are using mailing lists and e-mail for advocacy and activist purposes. Through targeted marketing, for example, groups are flooding officials, stakeholders and decision makers with messages in support of positions favorable to women or public protests against perceived injustices—a breakthrough in communication in light of the persistent difficulty in getting mainstream radio, television and newspaper media to cover women's issues. These efforts are beginning to link organizations around the world, leading to the creation of virtual communities focused on specific development issues and the forming of alliances enabling greater participation in international fora and decision making.[40]

Women in developing countries have also used electronic communication for networking to promote their business interests. This area is far less developed than that of politically activist networking, but it represents an interesting area with possibilities for further development. Federations of business and professional women from areas as remote as Mongolia, Vietnam, and Nepal joined in a business-to-business network that was connecting with businesswomen in North America as trade partners, suppliers, and networking contacts. Regrettably, this enterprise closed down at the end of 2000.[41]

Women entrepreneurs in small- and medium-scale businesses (SME) are using information technology in the operation and management of their businesses but apparently not to the same extent as comparable groups of men are doing. Information technology has not penetrated women's microenterprises in developing countries. However, data are very hard to come by on this area. Apparently, there are no multicountry surveys that compare the use of information technology by women entrepreneurs to that by men entrepreneurs. One survey done in Mexico showed that 64 percent of

women entrepreneurs (as compared to 83 percent of the men) in Mexico City used computer technology in their businesses, with 14 percent (and 29 percent of the men) of that group using local area networks and other sophisticated systems. Thirty percent of the businessmen owners and 22 percent of businesswomen owners regularly used the Internet in their work.[42] In Russia 60 percent of women SME business owners used computers in their business operation and management, but no figures were available for comparable groups of men.[43]

Women's nongovernmental organizations and women's businesses in developing countries are using information technology to make their organizations and enterprises more effective and efficient. In these cases, women remain the agents, and the technology serves them. In the case of consumer applications, the international private sector is attempting to capture women's purchasing power while clothing its efforts, in the language of IT advocates, as "empowering women."

With the news of women in the U.S. overtaking men as users of the Internet during the first quarter of 2000, more dot.com retailers are directing their Web presence towards women consumers.[44] Commercial forces are exporting this approach to women in developing countries. Commercial portals directed at women consumers have started up, aimed at women in China, India, and Latin America. Directed at the growing Chinese consumer market, Chinadotcom Corporation fills its http://www.cwow.com (Chinese Women on the Web) site with content on weddings, pregnancy, and parenting products related to these life events and stages.[45] L'Oréal markets beauty products to women in Latin America through its Spanish and Portuguese language site http://www.cadamujer.com. It, too, adopts a community service approach explaining that it supplies "an array of relevant information, community services and commerce solutions to enhance women's professional and personal lives," while offering them "direct online access to the local sites of the L'Oréal Group brands."[46] The multinational corporation Unilever is working through the women's content site iVillage on a regional site for Indian women designed to "build relationships based on an understanding of their needs." Unilever expects that 40 percent of all Indian women will be online in five years.[47] No user statistics are available for these sites, but it is clear that the international corporate sector is trying to target women who have significant amounts of disposable income.

E-mail is the major information technology application that women's organizations and individual women in developing countries use. The predominance of e-mail over other applications is almost universally true among women, given the time constraints that most women face. However, in developing countries much of the choice of applications is conditioned by the amount of available bandwidth and speed of the connections. Where there are good telecommunication infrastructure and fair numbers of women connected, there is more use of the World Wide Web. Where there is not,

concentration is on e-mail and electronic discussion groups. One can assume that as infrastructure grows, the particular applications used will evolve as well. However, the infrastructure constraints also mask problems with the World Wide Web in terms of relevance of content. There are immeasurable amounts of content on the Web; however, little of it appears to be relevant or useful to women in developing countries.

WOMEN AS PRODUCERS OF INFORMATION TECHNOLOGY

The issue of the relevance of Internet content to women in developing countries raises the issue of women as producers of information technology. Women are few and far between as **producers** of Internet content, programmers, designers, inventors, and fixers of computers. This issue has stirred much concern about women remaining passive consumers of IT rather than producers (of technology and of content) and lacking the skills and opportunities to attain leadership roles in IT. As the economies of the future are increasingly based around IT, women solely **using** information technology risk being disenfranchised from positions of power related to IT, and unable to develop IT that address women's needs, interests, and priorities that the men who design and produce the technology may disregard. Swasti Mitter expressed this at the Global Knowledge II Women's Forum in Kuala Lumpur:

> It is not only in the production of content, but also in the sphere of production of technology that women's presence is necessary for an efficient and equitable knowledge society. . . . The prospect of addressing women-specific questions in the configuration of software remains remote unless women themselves become visible in the community.[48]

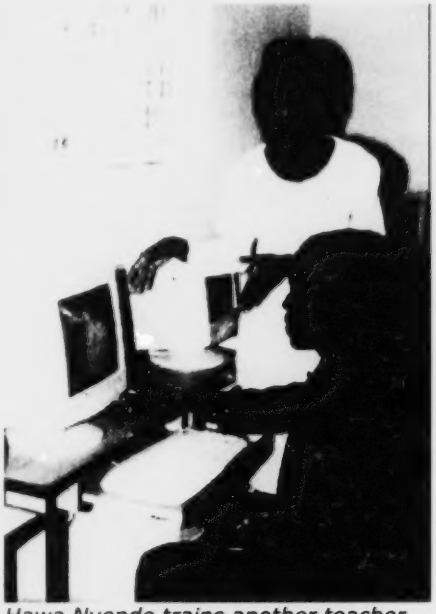
Women tend to be concentrated in end user, lower skilled IT jobs related to word processing or data entry and make up small percentages of managerial, maintenance, and design personnel in networks, operating systems, or software. Women's lower representation in the production and design of IT is a result of reduced access to education, sociocultural norms discouraging women from studying science and technology, and feminization of the IT jobs that women hold. These factors will be described in the section on "The Current Situation: Obstacles to Access" (pp. 27-36). The following section on "The Impact of IT on Women's Work" (pp. 37-48) will detail women's participation in the IT labor force.

WOMEN AND INFORMATION TECHNOLOGY DECISIONMAKING

An examination of the extent to which women are represented in decisionmaking in information technology in developing countries reflects the progress of women in the field and the possibility that women in positions of power could make decisions that would facilitate the entry of other women and alleviate some negative impacts of the technologies on women. As Gillian

Marcelle notes, "Decisionmaking affects what the IT sector produces and how it organizes production and interacts with society . . . [T]he existing systems of production and organisation of the IT sector negatively affect women and continue traditional systems of gender relations."[49]

However, available evidence indicates that women are conspicuously absent from decisionmaking structures in information technology in developing countries. These structures include boards and senior management of private IT companies; senior management and advisors of policy and regulatory organizations such as the International Telecommunication Union, the World Trade Organization, the World Intellectual Property Organization, technical standards setting organizations, industry and professional organizations such as the Internet Society, national policy and regulatory organizations, line ministries responsible for the IT sector, and international development organizations and agencies.



Hawa Nyende trains another teacher at the Institute for Teacher Education at Kyambogo, Uganda.

In line ministries of developing countries, out of 201 senior government officials responsible for information and communication technologies in developing countries, only 11 are women (5.5 percent). However, where there are women in top positions, it is significant. Women are the ministers of communication or telecommunication in three countries (Mali, South Africa, and Colombia) and deputy ministers of communications in five countries (Angola, Belarus, the Czech Republic, Ghana, the Kyrgyz Republic, and Tanzania). In all cases, these women's portfolios include responsibility for information and communication technologies. Although the numbers are miniscule, it is notable that there are more women in senior government positions related to IT in Africa than in other regions.[50] These few women have the potential to influence the course of information and technology development in their countries as well as regionally and globally through participation in ITU regional and world conferences.

Another indicator of women in decisionmaking positions in information technology in developing countries is the number of women from developing countries serving as officers (chairpersons and rapporteurs) of the ITU Study Groups in major areas of communications and technology development

(including impact of the introduction and utilization of new technologies on the environment of telecommunications). As the technical decisionmaking structure of the ITU, the study groups can influence the direction of the development of information and communication infrastructure and standards in developing countries. Fifty-one persons from national telecommunications agencies, related scientific and industrial organizations, and finance and development institutions are presently represented in the study groups: only two are women (3.9 percent). There are no women from Africa, Asia, or Latin America.[51] At the Internet Corporation for Assigned Names and Numbers (ICANN), the nonprofit corporation that assumes responsibility for Internet address space allocation and related matters and a major decisionmaking body in the Internet world, there are no women from the developing world among the 19 directors.[52]

Women's under- or non-representation in the decisionmaking process (in both the developed and the developing world) is particularly striking in the new IT industries, which are relatively free of the historic gender-based division of labor, and where one might expect women to fare better.[53] However, this disparity reflects the global division of labor, with women generally relegated to lower level positions and unable to break through glass ceilings of management. In many cases, however, lack of technical and managerial experience and training limits their rise.

The U.S. Government and the ITU are both making efforts to increase the number of women from developing countries in influential positions in IT. The number of women at the U.S. Telecommunications Training Institute, whose graduates frequently move into leadership positions in the information and communications technology field, has increased annually since 1996. The Institute has the explicit objective of increasing women's participation in telecommunications legal and regulatory reform.[54] Formed in 1998, the ITU Task Force on Gender Issues aims at getting more women into decisionmaking positions in information technology. It has sought to increase the participation of women at all levels in the telecommunications sector, including the private sector. The Bureau of Telecommunications Development (which has a very strong focus on information and communication technology) now routinely includes a gender focus in its major messages on development activities.[55] Additionally, in 2000 the United Nations Development Fund for Women, the ITU, and the United Nations Development Programme signed a memorandum of understanding guaranteeing that the impact of information and communications technologies on women will be included in policy dialogue and decision making.[56]

IMPACT OF INFORMATION TECHNOLOGY ON GENDER ISSUES: TRAFFICKING

One of the most sinister aspects of information technology, especially the Internet, is its contribution to the sexual exploitation of women. The amount

of sexually explicit material and the ease of access to it are well known.[57] The most common search performed on any search engine on the Internet is for the word "sex." Recently, the Internet has become a tool in the prostitution of women, where women are tricked or forced into performing sex acts for digital photos that appear on globally accessible web sites. The Internet offers a myriad of ways to sell sex. In Brazil customers can book prostitutes on the Web. Global sex syndicates are using the Web to recruit women from all over the globe.[58] These aspects together are referred to as the globalization of the sex trade. At the same time, however, antitrafficking activists in Brazil and elsewhere are setting up web sites to warn women about sex slavery.[59] The MiraMed Institute in Russia operates a web site, an electronic newsletter and an Internet chat room in Russian to combat trafficking in girls and women from Russia.[60] Thus, both the profiteers and those who combat them are using information technology.

THE CURRENT SITUATION: OBSTACLES TO ACCESS

We have seen that in most developing countries very small numbers of women have the possibility of using new information technologies. This section will examine the numerous constraints that have limited women's access.

WOMEN'S ACCESS TO NEW TECHNOLOGY

Women's access to information technology is not a simple question of whether there is a computer connected to the Internet that women can use. Numerous other factors are just as significant in determining whether women can access technology. These include education, financial resources, language, cost, location, culture, and skills. This section of the paper will look at how these complementary inputs affect women's access to IT in developing countries.

Literacy and Education

Women need basic literacy and numeracy in order to read and compose simple messages, navigate the Internet, and execute commands in most software applications.[61] As women make up nearly two-thirds of the world's illiterate, and one out of every two women in developing countries is illiterate, women are more likely than men to lack basic literacy and computer skills, which would enable them to take advantage of the new global communication opportunities.[62] Women face challenges in pursuing education at all ages because of lack of time to attend school, familial and household duties, lack of control of funds to pay for education, and sociocultural norms that give female education low priority. While female gender gaps in primary and secondary school enrollment have narrowed in recent years, girls still comprise two-thirds of the schoolage children in the developing world without access to basic education, and girls are much less likely than boys to enroll in mathematics and computer science courses. Female basic education in Central and Eastern Europe, where there are high levels of female adult literacy and primary and secondary school enrollment, is less of a concern. Here the relevant educational obstacle for women is the lack of affordable higher education and training for IT jobs. However, throughout Africa, Asia, Latin America, and the Middle East, basic education and literacy are out of reach for many girls and women, thus depriving them of the prerequisites for information access.

In addition to the literacy and numeracy needed to access information through IT, Professor Richard Heeks of the University of Manchester (UK) argues that IT users within developing countries often lack "other resources to interact with sources [of information] outside their own community." These include "source proximity," or an understanding of the context of the

information shared through the Internet, "trust, knowledge, and confidence/security."[63] Knowledge is pivotal because it helps IT users:

> to assess information, by assessing whether it is truth or lies, of value or not. It is knowledge that helps us to apply information, by adapting it to our particular needs and circumstance.[64]

Language

The overwhelming dominance of English and, to a lesser extent, of other major international languages on the Internet, excludes access to the majority of the world's population who speak other languages. This factor significantly impacts women and other marginalized groups without access to the formal schooling that would allow them to learn international languages, but it also cuts across class lines in regions where English is not the major regional language, such as the Middle East, Latin America, and Francophone Africa. Among responses to the APC's 1996 Women's Networking Survey, language was one of the top barriers to Internet use for women from Eastern Europe, Latin America, and Francophone Africa.[65]

Even users with basic proficiency in English experience discomfort that discourages Internet use when using other than their native language. Research on a technical training program in Mexico found that users with a low level of proficiency in English said that they were reluctant to access the program's online help center because it was in English.

Expanded Web page growth throughout the world in the past two years, however, has resulted in a greater amount of nonEnglish language Internet content. In 1999 English was the language of 95 percent of Web pages. By 2000, the estimate was 68.4 percent with predictions of further decline. By 2010, observers predict that Chinese will be the major language on the Internet.[66] Nonetheless, the Internet's present English language dominance demonstrates the heavy flow of information from the U.S. and Western Europe to developing countries and makes an exchange of information between the nonelites in the two spheres very difficult.

Time

An expert on women, science, and technology, Sophia Huyer, argues that:

> Women's time is a critical resource in short supply. Any systems or activities meant to improve their lives and increase their empowerment must be perceived by women to save time or increase their efficiency rather than add to the already overly long list of activities in a day.[67]

As the bulk of household and childcare responsibilities rests on women's and girls' shoulders, they are less likely to have free time to spend using the Internet whether at home, at work, or at public Internet centers. Women's responses to the 1996 APC survey confirmed that time is a major constraint

to women's access. Lacking time was repeatedly cited as an obstacle to "seeking out information," "becoming familiar with computer use," "getting help," "preparing materials," "uploading them and responding to e-mail," "setting up a web site," "hiring people to assist in moderating and developing online activities," "learning," and "screening through information." One respondent to the survey commented that "in some ways the Internet is a tool for those with lives of leisure." [68]

Women who either work or need to take care of their families may not be able to use public access Internet centers during the day, while evening hours when women take care of families or where it is unsafe for women to travel to and from a public facility may be equally problematic. Lack of time was cited as one of the reasons that the resident advisor of a telecenter in Ghana used to explain lower women's usage rates. Most of the female users of the center were not working women but students, who had flexible schedules that allowed them to frequent the center. Although the project utilized strategies such as a "Women's Week" to promote the center among women, female use increased only in the short term and then dropped off again. [69]

Cost

Private, home-based use of computers and Internet are currently available only to elites in developing countries. Equipment and connection costs are generally excessive for all developing regions, but are a greater obstacle for developing countries in Africa, South Asia, and Latin America and the Caribbean. In Ethiopia, 20 hours of Internet access per month for a year amounts to 8.4 times the GDP per capita! Even for the elite, this amount of usage would account for 50 percent of a university professor's take-home pay. The cost of a computer can be ten times the annual GDP per capita of many LDCs in Africa. In Vietnam, yearly dialup access to the Internet costs $360, while the annual per capita income is less than $350.[70]

Unlikely to have computers at home, most women in developing countries also cannot afford to use public access sites. User fees charged for Internet access at public venues may not be within reach for women who generally have lesser access than men to resources to pay for fees (averaging $1-$3/hour), and are certainly not within the reach of poor women. In developing countries there are few free public access points, such as at public libraries in the U.S.

As women continue to join the labor force in greater numbers, access to IT offered through the workplace is one possible avenue available to educated, middle class women with office jobs.[71] However, in most offices in developing countries, computers and especially Internet access are rare. Frequently there is only a single desktop computer and one modem with a dial-up connection that all staff share.[72] Moreover, women in developing countries are far more likely to work in the informal sector, including domestic services and home-

based working, or in manufacturing than in offices; women who work in these sectors would not have computer access.

Geographical Location

The geographic location of public Internet centers also affects women's access to information technology in developing countries. Women's mobility is considerably more limited than men's in most societies. This mobility may be further limited in conservative societies where religious or social customs do not permit women to travel in public without male supervision. When public Internet centers are located in unsafe neighborhoods or at a great distance from residential communities, women are less likely to frequent them.[73] Beyond safety issues, women's IT access can be inhibited when offered in settings and institutions that women are unlikely to frequent. Recommendations from the National Telephone Cooperative Association acknowledge this concern in developing sustainable telecenters:

> Consideration needs to be given to locating telecenters in gender neutral institutions. For instance, in several countries with a proliferation of "cybercafes" or cybershops, the customer base is predominantly male. If it appears that women may have a high demand for the services provided, telecenters should be located in institutions that are accessible to them and that are socially comfortable, such as libraries and schools.[74]

Since more women than men live in rural areas, the gender gap in Internet access runs parallel to the rural/urban divide. Rural areas where women comprise 60 percent of the population often lack the resources and infrastructure for IT.[75] Connectivity is frequently available only within capital cities and perhaps secondary cities in developing countries, while the majority of the population in many developing countries reside outside these cities in rural areas. UNIFEM and UNU/INTECH make the argument that:

> Women, with their special responsibilities for children and the elderly, may find it less easy than men to migrate to towns and cities. The urban bias in connectivity thus deprives women, more than men, of the universal right to communicate.[76]

While home computers and Internet access are rare in most developing regions, home Internet access is more prevalent in the Middle East, particularly in the Gulf States. According to a 2000 study, 72 percent of Arab Internet users surveyed said home was their primary place of access.[77] In societies like these, where women are hindered from participating in public spheres and therefore cannot access cybercafés, women may be able to move in "private spaces" more freely, such as in the home.[78] In these societies home access to information technology gives women access to information and opportunities for communication with other women, provided that they have appropriate skills and available time.

Social and Cultural Norms

Girls' and women's ability to access IT is also shaped largely by sociocultural norms that determine female behavior and interests. As discussed earlier, in many culturally conservative societies, women are often not allowed to go without supervision to public venues where men are present. Moreover, women may be uncomfortable frequenting a cybercafé with predominantly male users or seeking help from male staff. Cultural norms discourage interaction between women and men outside their family and women may also be unfamiliar and thus uncomfortable with interaction with men, due to sex segregated classrooms or schools, which are common in many Middle Eastern countries.

In addition, in most cultures, males are conditioned to be more aggressive than females. These behavioral norms may manifest themselves in interaction with boys and girls or men and women in sharing use of a computer, where boys and men tend to dominate the computer, edging out girls and women, whether at home, within families, or at a school computer lab or public cybercafés. The National Institute of Information Technology's "Hole in the Wall" Project in India demonstrates this concern. In three different pilot sites, NIIT installed a computer screen and keypad with an active Internet connection into the wall of a slum or school and through a hidden camera women monitored who would access it and how. Use was evenly divided between boys and girls at the rural pilot site, but was higher among boys than girls in the urban sites, allegedly because when boys pushed girls aside, girls withdrew because they were fearful of the physical threats that might arise from challenging the boys.[79]

Holding "women-only days" and establishing women-only access venues have been used in response to these cultural challenges. However, this frequently leads to criticism of inequity especially when such resources are in short supply. In Ethiopia, a deluge of protesting letters to the editor (all from men) followed a special Saturday training in information technology open only to girls. In Ecuador as well, men were resentful of priorities given to training women at the community telecenter.[80] In addition, the existence of women-only facilities can lead to suspicion and censure in some societies. In early 2000, a women-only cybercafé in Mecca, Saudi Arabia, was closed down because female users were reportedly using it for "illegal purposes," which were not detailed.[81]

Skills

Even if women have access to all of the complementary inputs described above, they still cannot access information technology without a minimal set of computer skills. This is illustrated by the case of the Bamshela telecenter project in South Africa. The telecenter had been operating for three years, but the users, who were primarily women, made use of it primarily as a phone

shop because they lacked the skills to use the computers and fax machines that were available.[82]

WOMEN'S ACCESS TO INFORMATION TECHNOLOGY EDUCATION AND TRAINING

In order to use more sophisticated IT applications, women need specialized training. Gaining sufficient skills for application of IT is almost universally cited as the most important determinant of women's chances for equal participation in IT.[83] "Unless women gain increased access to training in scientific and technological fields it is likely that even greater numbers of them will be disadvantaged by IT-facilitated changes yet to come."[84]

Studying Science and Technology

Science and technology (S&T) education is the prerequisite for work in information technology at the level of computer programmers, engineers, systems analysts, and systems designers. Training for these higher skill level careers in developing countries comes largely in the form of coursework offered in some secondary schools, vocational colleges, or universities.

In the U.S. in the last 30 years, girls' enrollment in college preparatory math and science courses has been increasing steadily. In California, more girls than boys are taking college preparatory math and science courses in middle and high schools. [85] However, girls still lag behind in physical and computer science. American women are much more likely to study biological and health sciences than physical sciences, engineering, or technology.[86] There is much concern in the U.S. about the low number of women students majoring in computer science. In 1998, women were only 15-20 percent of undergraduate computer science students at leading universities.[87] Women receiving bachelor's degrees in this field fell from 37 percent in 1984 to 27 percent in 1996.[88]

Women's enrollment rates in science are lower than those of men globally. Even once girls enroll in school, poor schooling and negative attitudes towards girl students in general and especially as students of math and science frequently leave them without the necessary basic education to continue in scientific and technological fields. Girls in developing countries are much less likely than boys to enroll in science and technology courses, mathematics, or computer science from secondary level on. The number of women in developing countries studying natural sciences at the tertiary level provides some indication of women's representation within these fields (See Annex I).[89]

Research on science and technology academic programs worldwide suggests that preconceived notions of science and engineering contribute to women's low enrollment in tertiary level programs in these fields. According to findings

from a 2000 study by the American Association of University Women (AAUW), girls and young women find technology-related careers unappealing because they associate them with jobs that are "solitary," "passive," and "sedentary."[90] Other research finds girls and women have the preconception that engineering is a "dirty, heavy or manual occupation" and they lack a clear understanding of what engineers do.[91]

Women outside of the United States also show an aversion to studying information technology. The few female students enrolled in the computer science major at a university in Mexico claimed that other young women did not choose this major because they assumed it was more difficult than other fields. Instructors in IT departments in Jordan, Mexico, and Brazil, among others, speculated that female students did not take the course because they were intimidated by the field of engineering.[92]

In developing countries, however, there is a great deal of variation in the percentages of women in natural sciences, computer science, and engineering. There are indications that in developing countries young women are not as affected as U.S. women students by attitudes that computer science is not an attractive field to enter. In developing countries, the few women who have both the aptitude and the attributes to enter this field of study recognize it as an important field for both self and national advancement and do not shy away from it. More than 50 percent of students enrolled in natural sciences (including information technology) in Argentina, El Salvador, Nicaragua, Panama, the Philippines, and Singapore were women. Women comprise more than 30 percent of university level students in natural sciences in a large number of developing countries across the regions (see Annex I). The largest proportion of women engineers is found in Central and South America and East and Central Europe.[93] In Malaysia, women are at least 50 percent of the students in information technology at public universities.[94] In Western Asia, enrollment at most universities is predominantly female. The high percentage of women studying natural sciences, as well as other fields, is due largely to the fact that many men study abroad, while women usually do not have this option. However, while large numbers of Western Asian women study scientific subjects such as engineering, these numbers are not reflected in the region's science and technology workforce. Due to the region's tight labor market and sociocultural norms that discourage married women from working, women constitute only a small percentage of the labor force, despite their S&T training. Thus, in this region social rather than educational obstacles prevent women from working in information technology and other scientific fields.

The area of greatest concern is subSaharan Africa. African women have the lowest participation rates in the world in science and technology education, at all levels. A recent report on higher education in Kenya showed that women prefer nonscience subjects including humanities and the arts, while their representation in all the sciences hovers around 24 percent. The Federation

for African Women Educationalists (FAWE) attributed this to "lack of self-esteem, poor self-image, and nonassertive behavior among girl students."[95] These reasons focus on the students and may be cases of "blaming the victim." Many (predominantly male) science teachers in Africa hold outmoded views that girls can't think or work scientifically and that science is too mechanical and technical for girls, thus discouraging female students.[96] Young women comprise only 2.1 percent of engineering students at the University of Science and Technology in Ghana, and 1.6 percent of engineering students in Kenya.[97] However, even in Africa there are some hopeful signs that could provide useful models for other countries. In Sudan, women comprise 15.8 percent of engineers and 41.2 percent of math and computer science students.[98]

Many factors, especially societal ones, impede women's ability to acquire training in information technology.

Roles in Family and Society

> Women's ability to make use of . . . training depends much on their position in society and family. A woman worker often has to cope with violence and abuse in the family, along with responsibilities of childcare. These factors affect her ability to pursue education and career progression.[99]

In many cultures, a woman has little autonomy from her family and husband. A woman may face the threat of abuse if she participates in community activities that her family or husband considers inappropriate or without value. In societies and cultures where women's public mobility is limited, women may not be able to travel to training, or husbands or families may not approve of their wives or daughters attending training in an unsupervised environment where men are present.[100] Similarly, since professors and teachers in IT-related subjects are usually male, this may deter women from studying these subjects in culturally conservative societies, such as in the Middle East, where female-male interaction is discouraged. Female students in an undergraduate information technology program in the United Arab Emirates reported feeling uncomfortable with male instructors in their engineering and computer science classes because they have been accustomed to having only female instructors throughout their primary and secondary education. This can be even more of a problem when training involves physical tasks, such as wire cutting or cabling in which some physical interaction may be necessary to assist a student with the task.

Cost

Cost is a major factor affecting women's access to IT education and training. Low income women cannot afford fee-based training courses offered at private training centers. IT training may be accessible to middle income women at a public vocational college or through a private training center.

However, women are less likely than men to have funds available for tuition or course fees because women have less control over family income in most developing countries. Scholarships are available at many institutions, but inevitably there are not enough to meet demand. Interviews with college instructors in Romania and South Africa showed that cost was a factor in limiting female enrollment in their IT courses. In Mexico, female university students said that the free tuition at their university was the primary reason for their enrollment in an IT training program. Instructors cited examples of female students who had to drop out of the IT training course because they could not afford the fees.[101]

For middle class women who can afford to take IT training courses such as those offered through fee-based training centers, the more affordable courses are often of insufficient quality to equip trainees with the skills to compete for well-paying IT jobs. For instance, in India where there is huge demand for IT training, many of the training courses that lower and middle class Indians can afford are shorter and limited in scope and therefore fail to equip graduates with the necessary skills to secure well-paying IT jobs. With one million Indians training at computer centers each year, the job market is flooded with candidates with basic skills, reducing the value of these skills in the job market. In most developing countries, there is sufficient good-quality training available, but the more valuable computer training is often too costly for both men and women.[102]

Schooling Systems

The institutional culture or structure in which the training is offered also determines women's likelihood of accessing IT training. This is particularly the case for IT courses offered as part of a degree at a university or vocational college and for special certificates offered at universities or technical colleges. In developing countries, much IT training is typically offered as part of academic degrees at universities or vocational colleges, because these types of institutions, particularly private

Saida Abouid (seated), Director of the USAID-supported Computer-Assisted Teacher Training Project works with Dominique Zemrag from USAID-Rabat's education office

colleges and universities that specialize in science and technology, usually have the resources to fund the costly facilities needed for such IT training. These kinds of institutions traditionally have lower female enrollment. Instructors in a computer networking training program offered at science and technology universities and colleges worldwide explained that there were fewer women enrolled at the school overall because the school had a reputation as being "mostly men."[103] In addition, training is commonly offered through engineering departments at these institutions where there are even fewer women than in other departments. Offering training in such departments filters out women from the outset.

U.S.-based research on women's enrollment in engineering and computer science academic programs shows that a small number of both female students and female teachers within science and technology schools or departments is a deterrent to women entering that department or school.[104] The absence of a critical mass of females in a particular department or institution conveys the message that it is an all-male culture and not welcoming to women, thus discouraging women from entering.

ACCESS ISSUES: GENDER OR POVERTY?

As noted in section one, within the digital divide, there can be many subdivides□by region of the world, by country, by gender, by class, by race and ethnic origin. The question emerges of the extent to which the obstacles and constraints that women in developing countries face are due to the poverty they share with men in their own country, or are they felt more because of their gender? Upon first consideration, some of the constraints seem to be shared by both men and women: the inadequacy of communications infrastructure in developing countries and the higher costs of telephone and Internet connections than in developed countries. Yet even in the case of these factors, the obstacles are greater for women. More women than men live in the rural areas of developing countries, where infrastructure is less developed than in urban areas. Within poor households, women are the poorest of the poor. They have less access to money in the family than their husbands. Other access factors have clear and obvious gender dimensions. In literacy and education, girls and women lag behind men in every developing country. Girls are far less likely to have the scientific and technical education that will permit them to profit most from information technology. Social and cultural norms work against women in accessing the limited facilities that are available, and women globally suffer from an overload of demands on their time far more than men. Lack of contextual information-use skills also has a gender dimension, since women's isolation gives them fewer opportunities to broaden their range of comprehension.

IMPACT OF INFORMATION TECHNOLOGY ON WOMEN'S WORK

Over the past 15 years, women's paid employment has increased throughout the world. The reasons for this increase include market liberalization causing lower wages and a greater need in a household for more than one wage earner, lower birth rates, urbanization, and greater education among women.[105] Even in more culturally conservative societies in the Middle East and North Africa where women's share of the total labor force is less than 20 percent, women are represented in larger numbers than 15 years ago.[106] Technological innovations and the increasingly globalized economy have created job opportunities for women in developing countries, particularly in the manufacturing and service sectors. (See below).

WOMEN IN AN INFORMATION AND COMMUNICATION TECHNOLOGY WORKFORCE

Emerging gender employment patterns in the IT sector are cause for concern. Despite being a very new field in most developing countries, gender inequities that are well established in other sectors of the labor force are already being replicated in the IT sector. Women tend to be poorly represented as administrators and managers and concentrate in lower level, end user positions.

Entering the world of information technology, women's traditionally high representation in secretarial positions led many women to acquire training in word processing for similar positions. Greater access to education over the past 20 years has produced more women secondary school graduates, the usual prerequisite for these jobs.

While women in white collar jobs in information technology in developing countries tend to concentrate in the secretarial ranks, they are making inroads into higher levels of the workforce in a number of areas, albeit in small numbers. In Latin America, East and Central Europe, much of Western and South East Asia, and in South Africa, where information technologies have been well integrated into both the public and private sectors, women are working as software programmers, CAD designers, webmasters, and network managers. In India, women comprise 19 percent of the IT workforce and 37 percent of employees in the IT-enabled service sector.[107] Women reportedly make up 20 percent of the software industry in Brazil.[108] In Malaysia, where government has made significant investments in education and training for both men and women, women have entered managerial and administrative positions in substantial numbers and are well represented in computer programming positions in banking, telecommunications, and insurance.[109]

The number of women in IT jobs requiring advanced skills, such as engineering and systems analysis, remains small. While data are not widely

available on the number of engineers in developing countries, statistics show that women make up as many as 32 percent of engineers in Bulgaria but as few as 2.5 percent of engineers in South Africa.[110] The relatively large number of women engineers in East and Central Europe is often attributed to the legacy of the communist governments' promotion of full employment for all citizens, which provided childcare and encouraged women to enter nontraditional sectors, including engineering.

Gendered Divisions of Labor

Assumptions are already being made in developing countries about which occupations are most suitable to men and women, and these assumptions may be determining the career paths in the IT sector that men and women choose. Women tend to be well represented in desktop publishing and software programming, but not in hardware design, operating systems, or computer maintenance. Male technical training teachers in Brazil see software, graphics, and desktop publishing as more "female," while associating hardware design and its maintenance with men. [111] Data from South Africa also show a gender division in the IT sector. While women make up 26 percent of IT employees overall in South Africa, they make up only 19 percent of data communications and networking jobs, the third lowest representation in IT jobs, next to hardware and computer architecture (14 percent) and information systems and information technology management (18 percent). They are best represented in education, training, and development (39 percent), end user computing (36 percent), and sales and marketing (36 percent). However, white males and females dominate IT jobs in all categories.[112]

The gender stereotyped division of labor in information technology that regards women as unsuited or unqualified for certain types of jobs frequently stems from employer attitudes. Several of the instructors and female students in the Cisco Systems Networking Academy Program that trains students for careers as computer network technicians found that employers perceive women as unqualified for networking jobs because of the supposed physical demands of the jobs, which they say require male technicians. Female instructors and students in the Philippines, Romania, and Russia found that employers often have a preference for male workers, with job announcements for computer network technicians frequently specifying male candidates. In the training itself, women students performed as well, if not better than, their male colleagues.[113] On the positive side, however, networking instructors in Mexico, South Africa, and the Middle East noted that discrimination against women based on stereotypes of the physical demands of work was becoming much rarer.

Several constraints common to other professional sectors also impact women's IT labor force participation. Women's participation in the labor force has always been contingent upon the state of a country's economy and

governmental priorities. When economies are strong and in need of both skilled and unskilled workers, women are encouraged to enter the workforce. During economic downturns, women are the first ones to be laid off, and men are given preference for vacant positions, because of men's traditionally perceived role as family breadwinner in most societies.[114] Employers frequently give preference to male candidates over female candidates for a position because of their identification of men as the support of the family.[115]

Women's ability to work is significantly shaped by the availability of childcare, flexible work hours, and maternity leave. Such benefits are traditionally more likely to be offered in public sector rather than private sector jobs. For this reason, women generally prefer government jobs.[116] However, as many governments have shrunk in the past 15 years due to structural adjustment programs and deregulation, and companies have trimmed budgets to cut costs, social services such as maternity leave and childcare have been cut back or eliminated. Moreover, in many countries, governments mandate that employers provide certain benefits, such as maternity leave, but place the full responsibility on the private sector to provide them. As a result, employers frequently discriminate against hiring women to avoid financial responsibility for these services.[117] Since most of the newly created jobs that arise in developing countries will be based in the private sector, the lack of benefits in these jobs will impact women's ability to pursue them, even if they are qualified and the jobs are available.

Geographic location of the job opportunities also influences women's ability to participate in the workforce. As discussed earlier, women's mobility is much more limited than men's due to social constraints and familial obligations, so women may choose not to take the job if the job is not local. While the IT economy theoretically eliminates distance as an issue, the reality is that most major employers using and producing information technologies are still based in major capitals or large cities, which may be far from women's homes and families. Married women are also much less likely than men to relocate to secure a job in their field.

Feminization of IT Occupations

Even if women are able to acquire better education and training and begin to enter IT fields in greater numbers, women's leverage within the IT job market may be undercut by the feminization of certain IT occupations whereby "large numbers of women enter a profession and as a result, there is a drop in salaries, status and working conditions."[118] As Reardon warns:

> As computer-based skills become more commonplace, and as the need for more workers to use them in a greater variety of ways grows, more women will be again recruited. But this will be at a lower wage because these will be no longer be considered specialist skills, merely something that women can do.[119]

Feminization has plagued other sectors, perhaps with the exception of law and medicine, and Hersh raises the question of how engineering and IT professions can be opened up to women and "become a genuinely gender neutral profession without a resulting drop in salaries and status."[120]

The positive aspect of women's new entry into the labor force in jobs related to information technology, albeit largely in end user entry level secretarial positions or manufacturing jobs, brings many women disposable income for the first time, raises their status in their own eyes and in those of their family, and frequently leads to their desire for more training and upgrading of skills.

IMPACT OF GLOBALIZATION ON WOMEN'S WORK

Much of the impact of information technology on women's work in developing countries results from globalization. Globalization (also frequently referred to as global restructuring to emphasize its social aspects)[121] refers to the phenomenon that emerged in the 1970's involving the spatial reorganization of production, movement of industries across borders, and spread of financial markets that resulted in flexible production methods and integration of production into global commodity and production chains. "Businesses could treat the whole world as their field of operations and redeploy their capital and move the location of their production at will."[122]

Gender Issues in Globalization

In many countries women became the preferred candidates for certain jobs needed in a global economy. These ranged from manufacturing, where they were regarded as nimble, docile, and more able than men to perform repetitive tasks, to services (including everything from data entry to domestic and sexual services). A major motivation in the shifting geographic division of labor was the search for cheap labor, which was frequently associated with women workers.[123] From the 1970s on, an unprecedented number of women workers from developing countries entered both the formal and informal labor force to service the global economy, with the phenomenon coming to be known as the feminization of labor. The phenomenon was most marked in Asia, but affected much of Latin America as well. It has had little impact in Africa (only in parts of North Africa and in South Africa) and is only now coming to European transition economies.

In general, globalization has not changed gender divisions of labor. The least skilled levels of work with the lowest remuneration continue to be assigned to women following nearly universal gender divisions of labor and patterns of work organization.[124] For poor women, existing inequalities and insecurities have intensified. Some unskilled women have lost their livelihoods as alternate sources produced the goods cheaper and faster. For some women workers, it has meant a loss of rights, benefits, and job security. For others, particularly those educated and with skills, it has meant new opportunities

and better paying employment.[125] Globalization has also meant outmigration for many women from developing countries.

Impact of Information Technology on Women's Work

Information and communication technologies are both enabling as well as a contributing factors to globalization. Information and communication technologies made global financial markets possible.

Examining the issue of the impact of information technology on women's work in the context of globalization underlines the differences in the issues of information technology and women's work between developed and developing countries. In developed countries, most of the literature on the impact of information technology on gender and work deals with the association of men with technology and power.[126] In developing countries, women are looking at the issue not only in terms of gender relations with the men in their society, but also at Western dominance over innovation and as the source of technology.[127] Some argue that the new technologies are not appropriate for women because they are imported. However, this position seems to be head-in-the-sand. Information technology is no more foreign than air travel or electricity. The technologies are there and will not be displaced. It is more appropriate and effective for women to devise ways of dealing with them to improve the situation of women than to reject them for being foreign.

As with globalization generally, the impact of information technology on women's work through globalization has been most evident in Asia first, than in Latin America and the Caribbean. Africa is effectively absent from this process. Summarizing the results of the United Nations University/Institute for New Technologies (UNU/INTECH) project on Monitoring the Impact of Technological Changes in Women's Employment in Asia, Mitter concludes that the introduction of new technologies has changed women's work in three ways:

- By altering the process of production in manufacturing and service industries through automation, deskilling of workers and augmenting the skills requirements of key jobs
- By the introduction of new products or services in the market, such as electronics, computer peripherals or information processing work
- By shifting production that often used old technologies to locations that are distant from the main sites of commercial units or to home-based workers.[128]

Although Mitter's research deals with Asia, most of her conclusions hold true for Latin America and the Caribbean as well.

In the Manufacturing Sector

In the first phase of global migration of manufacturing to Asia in the 1970s, the IT-related jobs were labor intensive, assembly line jobs largely involving

the assembly of electronics. Women's wages in these jobs were low; hours were long and working conditions harsh.[129]

In the last 15 years, the pattern has changed. Information technology has become the driving force behind the new phase of globalization, which began in the '80s. Employment in information technology in manufacturing has changed from making information technology (e.g., electronics assembly) to using information technology in nearly every manufacturing industry. Globalized manufacturing still demands cheap labor (by comparison to Europe and North America) but with greater technical and cognitive skills than in the first phase of industrialization in developing countries.

In the move to the knowledge economy, computer literate skilled technicians and engineers are needed; nimble fingers have become largely redundant. Information technology and the concomitant changing skill requirements are decreasing the number of women in industrial jobs in developing countries, particularly in Asia. In Malaysia, women made up 80 percent of industrial workers in the first phase of industrialization. By 1986, the percentage fell to 67 percent and continues to fall.[130] Latin America, too, follows the pattern of lower skilled women workers in the electronics industry being displaced by men as technology advances.[131] Managers are hiring younger, inexperienced men from technical schools instead of retraining previously employed women, despite the fact that many of these women had been working with the company for two decades.[132] Women are not getting the chance to learn new skills and retain their employment. As Reardon shows, men are more likely to get training, both at school or college and at work, and thus are in a better position to get jobs using more advanced forms of technology.[133]

Although conditions were harsh in the manufacturing jobs that employed women in large numbers, women do not want to lose them and return to their prior situations. They see their entry into the labor force as a positive gain in their lives.

They earn their own income and are not dependent on male family members. They work hard in the family as well as in the factories, but also enjoy an independence they never had before.[134]

Changes in the Organization of Work

Another aspect of automated technology that has decreased the number of women workers is the demand for flexibility of employment and the introduction of work in shifts. Demands of home and family plus the insecurity of travel to and from work after dark frequently prevent women from taking jobs in off-peak shifts.[135] Some countries (e.g., Bangladesh) prohibit women by law from working at night.[136]

Other changes in the organization of work accompanying technology-intensive manufacturing include just-in-time (JIT) production techniques and new

management strategies such as Total Quality Management (TQM). TQM is crucial to JIT for quality control, and the two are usually employed together. There may be positive aspects of TQM for women workers—their input may be realized and valued and they may be promoted. Management gains from the input of women blue collar workers who are given added responsibility in TQM but generally no additional compensation. Both the JIT and the TQM philosophies may lead to a reduction of the number of women's jobs in industry because of the TQM demand for increasing technical skills and high levels of education. However, the effects of TQM on women's work have not been sufficiently studied as yet to make definitive statements about its impact on their jobs.[137]

The Service Sector

At the same time that information technology (particularly through automation and robotics) is making many women's manufacturing jobs redundant, it is creating other jobs that are largely taken by women in the service industries, in information processing, banking, insurance, printing, and publishing where the skills requirements are higher than in the first phase of manufacturing jobs.

The entry of women in the new technology service sector is recent. However, the jobs are numerically fewer than those that had been created in manufacturing. Not only are there fewer jobs, but the women who have lost manufacturing jobs are generally not able to move to new service industry jobs. The service jobs show a preference for young women, likely to be single and better educated than those who had worked in manufacturing. "The tendency is to hire a new generation of workers for each new generation of technology."[138] Mitter refers to the age bias in globalization:

Jamaican staff of the National Family Planning Board applying new skills online

> . . . (G)lobalization has brought new opportunities to young women with familiarity with English in new service sector jobs, but has made a vast number of over 35 year olds redundant, either because they are in declining industries, or have outdated skills.[139]

Within the service sector, the major employment for women has come in information processing jobs. Globally these jobs are done almost entirely by women, probably because of the association of women with typing, since data entry is done using the QWERTY keyboard. Of the data entry workers in the West Indies 99 percent are women.[140] The jobs were relocated from developed countries because the comparative wages of women (the jobs had been done by women in developed countries under the same gender division of labor) in developing countries were one-sixth to one-twentieth those of women in developed countries. The going rate for data entry in the Philippines is $4-$6/hour with high accuracy while wage rates are as low as $1.00 per hour are found in Jamaica. Medical transcribers in India earn an average of $1200/annum in comparison to $25,000 or more in the U.S.[141] Nevertheless, the rates are attractive locally and comparable to those of local white collar workers and professionals.[142] While the Philippines is the world leader in remote data entry in terms of total number of women workers, large numbers of women have been employed in this field in Barbados and Jamaica for the last 25 years. More recently many of the other West Indies island nations have entered this area.[143] Large numbers of women are also employed in data entry in China, India, Singapore, and Vietnam.

Labor unions in developed countries have criticized the export of information processing jobs to developing countries as taking away jobs from countries where workers enjoy a high level of social protection and good working conditions to those where wages, controls, and benefits are low. Almost as a rule, the developing country IT jobs that women hold are nonunionized, with heavily enforced productivity targets.[144] Information processing jobs in developing countries have come under heavy criticism for their potential health and safety hazards. Cases where workers are monitored and not allowed to talk have been reported, and breaks are infrequent. Because of the long hours and absence of ergonomic working conditions, the women workers are subject to eyestrain, back injuries, and repetitive strain syndrome.[145] Women working in the banking sector in Sri Lanka reported the following:

> Virtually all women working on computers complained of eyestrain and headache, arising from their work. . . . Even though the physical work environment was considered to be comfortable, these employees mentioned that they often felt stressed in their work as they found it quite demanding to cope with both efficiency and speed.[146]

Despite the assembly line "electronic sweatshop" nature of the work, employers in the West Indies try to instill the idea of professional stature in the jobs by enforcing "pink collar" dress codes of suit skirts and high heels, required by the job but not by the work.[147] Underlining the factory nature of

the work, shift work is the norm, with many companies operating around the clock. Most workers are in the 17-29 age range, recruited directly from high school.

The skills requirements for these jobs are not high. Women need keyboarding skills, English or French (for those working for French companies particularly in Morocco, Madagascar, and Mauritius). They are generally high school graduates, but high school graduation is not a requirement for many of the jobs. However, these are higher requirements than those that employers demanded in the first phase of feminized globalization manufacturing jobs in developing countries.

In the service industries of banking, finance, and insurance, women are also concentrated at the lower and less skilled employment levels. Women are well represented in banking in India, Sri Lanka, and Bangladesh.[148] In India, women made up 70 percent of the workforce in banking by the middle of the last decade as compared to only five percent twenty years before. Women's employment in the telecommunications industry in Malaysia reflects similar percentages.[149] However, they tend to be data entry clerks, computer typists, or tellers; the percentages of women in electronic data processing sections and in management are low (ranging from one to 12 percent in both in India).[150] Since women have entered as clerks and typists, they will need training and upgrading to retain their jobs. If not, these jobs are likely to be automated in the next phase of technology development, and the women working in these service jobs will suffer the same fate as did those who worked in manufacturing during the first phase of globalization in developing countries.

The Knowledge-Based Economy

The first wave of IT-aided service sector jobs for women in developing countries was in online export-oriented information processing (especially medical transcription and airlines, banking, and insurance data entry). Many of the new jobs are in call centers—providing customer services by telephone—in geographical information systems, and in software. As the IT jobs come to reflect the movement towards a knowledge-based economy, the skills requirements advance as well. Many of the women working in medical transcription have degrees in pharmacy. All need excellent knowledge of English as well as familiarity with American accents.[151] Young women working in call centers in Malaysia are expected to be multilingual.[152] These jobs have become widespread in Malaysia and in India, especially in Mumbai and New Delhi. The Philippines is expected to become a major competitor in this area soon. In Malaysia 12 percent of the jobs in firms surveyed were in teleworking, largely call centers. By 2007 it is predicted that India will have a million jobs in call centers, staffed largely by women.[153]

Women have entered high skilled jobs in information technology in developing countries. This has happened particularly in countries where national policies have promoted science and technology education and where young women entered these fields—in many cases in percentages far greater than in developed countries.[154] Countries where women have made notable inroads into highly skilled work, such as software programmers or computer analysts, include Brazil, India, and Malaysia. In India, women occupy nearly 20 percent of the professional jobs in the software industry, with higher percentages found in Calcutta and Bangalore.[155] They are 30 percent of IT professionals, including those at the professional level, in Malaysia.[156] However, nowhere are these jobs the majority of those held by women in the workforce nor are women the majority of workers in these occupations. The women working in these areas comprise a small, educated elite. However, it is an important area for women to break into and to become role models for the next generation whose numbers in these fields are likely to increase.

Changing Locations of Work: The Informal Sector and the Casualization of Labor

The advent of information technology and globalization has brought changes in the location of work. There are two major aspects to the spatial reorganization of women's work under the impact of information technology in developing countries: home-based work and teleworking. One uses old technologies and the other, new. Both result from subcontracting arrangements, primarily in Asia among the developing countries. In the first, using old technologies and facing increased international competition from automated manufacturers, the Asian corporate sector has shifted production to informal sector national subcontracting to reduce costs. Manufacturing is often done in small units, part of the clandestine economy, employing women without fixed contracts and without benefits (such as maternity leave or childcare) or unionization. Women who have lost their formal sector manufacturing jobs frequently turn to these less desirable jobs to remain in the labor force. This phenomenon is often referred to as the casualization of labor. These jobs frequently take place in the home. "It is one of the incongruities of industrialisation that homeworking should flourish within it."[157] Women in China have been particularly affected by this phenomenon.[158]

Teleworking—New Technology in Homeworking

The second aspect of the spatial reorganization of women's work under the impact of information technology is teleworking. It also involves casualization of women's labor combined with high technology. Teleworking refers to distant working whereby employees or freelancers work using telematics at a site that is geographically separated from the main office. It can be home-based or it can take place at a location set up by the employer separate from the main office (which may be in a developed country). The areas where

teleworking employs women from home tend to be in printing (entering of manuscripts, editing, proofreading, and design), translation, and graphics.

However, most of the new jobs in teleworking are situated not at home, but rather in premises established by the subcontracting employer while the principal employer is located in a developed country. These are essentially service sector jobs and share many of the same conditions and problems of the other IT-generated service sector jobs for women that have already been discussed above.

Both teleworking from home and low skilled home-based work are sometimes promoted as being more convenient for women with childcare and household responsibilities. However, these subcontracting arrangements require equipment that generally crowds the home, and women can not take care of children and work effectively at the same time. (At the upper income end of teleworking, women teleworkers frequently hire someone else to come into their home to take care of their children and do their housework, while they work). Homeworkers lack the rights and benefits associated with regular employment: seniority, promotion, pensions, and paid leave. Despite relatively high wages for teleworking, women working from home are never paid as much as women working on the company's premises. Moreover, the burden of training and skill upgrading rests on the individual homeworker.

TRENDS AND ISSUES

While information technology has created many new jobs for women in developing countries, with advances in technology, women have lost many of those created in the first wave of industrialization and are finding fewer new jobs in the second wave of computer-aided manufacturing and services. As automation penetrates more industries and services and more areas of the developing world, the pattern will repeat itself. Concentrated in the low or unskilled end of employment, women are not getting the training that the new jobs require. Increased training for women as well as increased efforts to get help in fulfilling their social roles are imperative for women to retain the employment gains of the first wave of the impact of information technology on women and work in developing countries.

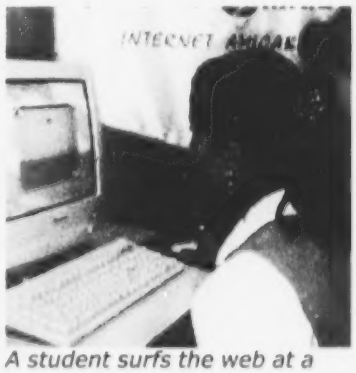
In order to retain and build upon the employment gains associated with globalization and information technology, women in developing countries need to move into more technically as well as cognitively oriented, better-paying jobs. To do so requires accessing the educational and training opportunities necessary to equip them for changing skill requirements. Skill requirements advance in step with the advance of technology. Women will also need to confront gender-based obstacles: the greater demands on them for the maintenance of household and family and the discrimination that women in all societies face as they try to move into positions normally associated with men. With economic liberalization and the decline of the role

of the state in providing social assistance, women will have to face issues such as job security, insurance, maternity leave, and healthy and safe working conditions.[159]

There are some particularly bright spots among the gains for women's employment brought by information technology. More young women are doing jobs previously done by men and taking places in new fields of work created by developments in technology. More young women in developing countries are studying computer science and related subjects. They are moving into management positions in the sector as well. As they do so, it will become easier for others to follow. But, their numbers are small. The challenge is to increase the number of women in IT.

Lessons for Other Areas

The jobs that women have gained through information technology have been associated with areas with high rates of female literacy in Asia (notably in the Philippines, Thailand, and Vietnam) and Latin America. As information technology becomes more tightly linked with the development of knowledge economies, education for young women becomes more and more important. The low literacy rates of women in Africa are barriers to women's advancement in jobs associated with information technology as well as in their use of the technology. In the transition economies of Europe and Eurasia, economic liberalization is occurring and along with it, more new jobs using information technology are appearing. Since they are well educated, women in these countries should find themselves well placed to take many of these jobs. However, the withdrawal or reduction of state support in social services, particularly in childcare, is likely to hamper women's ability to enter new fields and simultaneously handle their multiple roles.



A student surfs the web at a neighborhood telecenter in Asunción, Paraguay

In the first section of this paper, we argued that if women in developing countries are not part of the information revolution, they will be further marginalized from the economic, social, and political mainstream. The preceding sections (pp. 13-36) assessed women's access to IT in developing countries and the impact of IT on women's labor force participation. In the following two sections (pp. 49-73), we will examine the opportunities that the new technologies present for women's empowerment, first for their economic empowerment and then for their political empowerment.

OPPORTUNITIES FOR WOMEN'S ECONOMIC EMPOWERMENT THROUGH INFORMATION TECHNOLOGY

IT can help women in developing countries work more efficiently and productively in their present work as well as in new opportunities presented by the information economy.

UTILIZING INFORMATION TECHNOLOGY TO IMPROVE WOMEN'S CURRENT ECONOMIC ACTIVITIES

The range of women's economic activities in developing countries is very broad. It includes formal sector and informal sector employment, as well as self-employment in farming (particularly in Africa), trading, and crafts production. Increasing numbers of women entrepreneurs run small- and medium-scale enterprises. There are numerous possibilities for IT to improve women's economic activities in these areas and in all of them increased access to information is probably the greatest benefit that IT can bring. The ILO argues that increased access to information is most beneficial where the fewest alternatives exist.

Since the principal consequence of IT is greater access to and use of information, it is precisely those locations that have the least of both where the technologies could have the greatest impact.[160]

Farmers

Although women play an important role in agriculture, the major industry of most developing countries, they have very little access to information to help them improve their productivity and increase their economic contribution.[161] Hilda Munyua details the importance of information to improving women's agriculture and rural development.

> Information can empower rural females to participate in decision making, exchange ideas with others in developed and developing countries and improve the quality of life of the people of Africa. [162]

Given the paucity of information resources available to rural women farmers, IT (the fastest and cheapest means of information exchange) has great potential to help meet the needs of rural women farmers and to benefit rural communities. IT could provide women farmers with guidance on where and when to sow, harvest, and market their produce to avoid having to off-load their goods at throwaway prices. Women agriculturalists need information on improved farming technologies, access to credit, agricultural inputs, transportation systems, product potential, new and environmentally sound production techniques and practices, new markets, food preservation and storage, trade laws, trends in food production, demand, and processing. Women farmers could improve their productivity with information on

improved seeds, alternate crops, and weather. They also need to exchange indigenous knowledge.[163] The problem is access: how to get information to these farmers and at the same time enable them to communicate with others.

Radio is probably the IT most accessible to women farmers in developing countries. The Union of National Radio and Television Broadcasting of Africa (URTNA) and the WorldSpace Foundation are potential sources of content that would be useful for women farmers. URTNA plans to pool relevant programs for female farmers and redistribute them to local radio and television stations.[164] Women'sNet in South Africa runs a project that brings together women's organizations and community radio stations in developing relevant content for the local context.[165] In 1999 the WorldSpace Corporation launched the AfriStar satellite to broadcast digital audio and multimedia programs to compact radio receivers in Africa. The WorldSpace Foundation was founded to provide educational and information programming broadcast via AfriStar to "people in developing regions of the world who are disadvantaged by illiteracy, poverty or geographic isolation."[166] Through the Foundation, the Africa Learning Channel (based in Washington, D.C.) provides content on social and economic aspects of rural development, with a special interest in rural women and their rights.[167] The WorldSpace Foundation is seeking additional partners among development organizations, particularly NGOs, to design relevant content for women farmers.

The cost of radios remains a constraint. Battery radios are too expensive for most rural women, and so, too, are the digital radios that receive WorldSpace satellite transmissions (the cheapest receiver is $160 in the U.S., before delivery charges, duties, and taxes). Windup radios manufactured in China and elsewhere that are beginning to appear in markets in Africa for under $30 offer inexpensive possibilities of rudimentary IT for women farmers. Another cost-reduction strategy is shared radio access through community centers. Zimbabwe has more than 50 Radio Listening Clubs, where women assemble at a local community center, listen to a half hour program, and then discuss it.[168]

Information Intermediaries

Given language, technology skills, and cost issues, information intermediaries would be useful in connecting rural women with the information they need. They could be extension agents, community workers, or simply young school girls from the community who know English and can use computers, who would work at community centers to get information from international sources and relay it to local women farmers. They could also assist the farmers in two-way communication, delivering their messages transmitting indigenous knowledge, requesting agricultural advice, and sending e-mail from the farming community to the research station. The involvement of school girls translating and passing information to their mothers might stimulate them to consider remaining in rural areas and taking up modern

farming as a career. For most farming communities, a dedicated donor-financed telecenter would not be necessary to do this. All that is needed is a PC with the capacity to receive/send faxes, and a telephone connection with Internet access at the community center and a small stipend for the school girls, at a cost of roughly $1000 per community per year.

There are a number of ongoing projects using IT to bring information to rural women. The Government of Burkina Faso operates *boutiques d'information* (information stores), directed at rural farmers, with special emphasis on women, to try to meet their information needs, with emphasis on agricultural production and marketing. The *boutiques,* which are presently in operation at four sites, aim to be a demand driven IT-based information service with an emphasis on interactivity. The project uses local radio to maximize the dissemination of information.[169]

In the Western Cape in South Africa, community center staff working with a women's group called Masizakhe ("building together") use materials from the Internet and on CD-ROMs to deliver information on organic gardening. The group is also learning English, using both CD-ROMs and the Internet. They are undertaking collective activities to raise funds to enroll in distance adult education courses through SANGONet, a progressive Internet Service Provider located in Johannesburg.[170] Where telecenters exist in rural areas and when efforts are made to attract women users, women are using them. Women farmers in Uganda use the Nabweru telecenter, near Kampala, to obtain agricultural information. The women attributed measurable increases in their monthly incomes to information they gained at the telecenter on new methods of producing maize, fodder, and sweet potatoes, zero grazing, poultry keeping, and milk production. They also use the telecommunications facilities at the center to get prices from nearby markets in order to make marketing decisions. The center has a link to the Uganda National Council of Science and Technology through which women farmers can receive online agricultural advice.[171]

Entrepreneurs

Increasing numbers of women in developing countries run small businesses, many of them in the informal sector. According to the National Foundation for Women Business Owners, women-owned businesses comprise between one-quarter and one-third of the formal sector business population around the world.[172] In Uganda, for example, women are the majority of an estimated 800,000 SME entrepreneurs who provide 90 percent of nonagricultural private sector employment in the country.[173] As with other women's economic activities, the most valuable application of IT for women small business owners is information□accessing information to facilitate their business and generating and disseminating information about it.[174] Women entrepreneurs globally have said that access to information, especially market information, is their first priority in accelerating the growth of their businesses.[175] Although

there are considerable start-up costs (obtaining electricity and a telephone line, purchasing a computer, and subscribing to an Internet Service Provider), the amount of information available from the Internet is massive compared to the cost. UNDP points out the numerous benefits that small businesses can obtain from IT, in particular, the Internet.

> The potential is not limited to companies with sophisticated web sites, or to customers with credit cards and electronic banking. There are many ways of using the Internet to do business—from making contacts and checking prices to displaying goods and entering into contracts. Small businesses everywhere are exploiting the opportunities.[176]

Women entrepreneurs in developing countries can secure gains from IT with little technical training. After an Internet training workshop for members of the Association for Support to Women Entrepreneurs (ASAFE) in Cameroon, Bio-Vital, an ASAFE member that manufactures cosmetics made from local herbs and plants, used the Internet to locate a French company that now buys 80 percent of its production.[177]

Besides information deficits, most women entrepreneurs need to improve their technical and management skills. Even in remote areas and at times when they could not attend classes, women can use the Internet to gain these skills. Gisele Yitamben, president of ASAFE, says that she values the Internet not only for the information that can be accessed but also because of the possibilities for education that it brings to women entrepreneurs.[178] *Mujer y Negocios* (Women and Businesses) is a self-financed portal that helps women's enterprises in Latin America use information technology tools. It instructs women businesses in using information technology in their everyday operations as well as in identifying new markets for their products.[179]

Small Business Benefits from IT

The ways in which small businesses can benefit from IT are not gender specific. However, they are worth pointing out because women entrepreneurs are less likely than men to use IT in their businesses, and few projects to accelerate women's small business growth include the use of IT. In fact, few small businesses in developing countries, whether owned by men or women, currently use these technologies.

The major information needs of small businesses in developing countries are for information about supply (obtaining inputs), demand (new and existing customers), finance (business management and obtaining additional finance), the environment in which they are doing business, and skills. They tend to rely heavily on informal information (from friends and family) that may be inaccurate. While too much reliance on formal information also has its drawbacks, the businesses need to access formal information to balance the sources from which they draw. Web sites can provide information about the business to potential clients, as well as sell products and services. Information

technology can reduce administrative costs, speed up business transactions and link local businesses with supply chains. "Promoting E-commerce Competitiveness: a Briefing Kit for Businesswomen in Africa" spells out these possibilities in detail.[180]

Heeks suggests that small businesses of 10 to 20 employees grossing $20,000 or more per year could benefit from information technology. Many women-owned businesses fall into this category. Heeks feels that SMEs should obtain IT in the following priority order: fixed-line telephone, fax, mobile phone, e-mail, Internet access, and Web site. He estimates the cost of a personal computer with Internet access in a developing country at $1000/year.[181] Regrettably, these costs are greater in developing than in developed countries, and the returns in income are less. However, they are generally worth pursuing in the global era and will become more essential as time goes on. Additionally, these costs apply to businesses that acquire onsite IT. Smaller scale businesses can access and profit from IT at public access sites.

Ghanaian women train to use computers and the Internet at a USAID-supported community learning center (CLC)

Many women entrepreneurs in Africa are traders, ranging from micro-trading in foodstuffs to large scale import-export trade. There may be applications for information technology even among the smaller scale traders. The Grand Coast Fishing Operators' Union, an organization of women who market fish and fish products, uses IT to exchange information on supply and demand between their different locations on Kayar Beach along the Atlantic coast of Senegal.[182] The women feel that this tool has improved their competitiveness in the local market. They are planning a web site to enable the nearly 7500 members to promote their produce, monitor export markets, and negotiate prices with overseas buyers before they arrive in Senegal.[183] In Uganda both government and private initiatives are using IT for women's economic empowerment. The Council for Economic Empowerment of Women in Uganda (CEEWU) is establishing a Women's Information Resource Electronic Service (WIRES). According to one of the project officers:

> [Using the Internet] WIRES will give information on how to get and use credit, information on agriculture and any other activities women are engaged in. Through our WIRES centers we hope to empower women with information on how to access credit and start profitable enterprises. In the process the women will be able to generate

resources to help them acquire property and further their economic base, thus reducing their dependence on men.[184]

A Ugandan woman electronic engineer living in Canada is the force behind the creation of the Women of Uganda Network (WOUGNET). WOUGNET encourages women's organizations and women entrepreneurs in Uganda to use IT to improve women's economic and social situation. It conducts research on women's use of information technology in Uganda and has a web site (http://www.kabissa.org/wougnet), which is a comprehensive source of information on women's economic activities in Uganda, including trade and agriculture.

The suggestions provided above only touch the surface of possibilities for using information technology to empower women in their current economic activities. More research needs to be done in this area, particularly with regard to agriculture, trade, and other small scale enterprises.

IDENTIFYING OPPORTUNITIES FOR WOMEN IN THE NEW ECONOMY

The new economy offers a number of opportunities for women in developing countries. Definitions of the new economy, also called the knowledge-based economy, the information economy, the digital economy, and the networked economy, cover nearly every aspect of information-intensive economic activity that uses information technology, from computer manufacturing to Internet commerce to teleworking and information service industries (including finance, banking, and insurance). Much of the literature on the new economy focuses on two aspects—e-commerce and outsourcing. Outsourcing is explicitly associated with developing countries. E-commerce, on the other hand, has been slow in reaching the developing world.

Outsourcing: Teleworking and Teleservices

Outsourcing is the relocation of information intensive jobs from high-wage countries to developing countries. In the developing countries those working in the jobs, which involve information transfers by telecommunications, are said to be engaged in teleworking or teleservices. Teleworking and teleservices are the areas of the new economy with the largest growth potential for developing countries. The ILO predicts that there will be 12 million new jobs in IT-enabled services in developing countries in the next decade, as employers look to developing countries for cost advantages over U.S. or European employees.[185] The size of the international outsourcing industry is estimated at $103 billion.[186] We will examine how women could obtain a substantial proportion of these jobs.

Teleworking is remote work in the sense of being remote from the source of the work, which might be San Jose CA or Burlington MA or Fairfax VA. Notwithstanding the slogan that location does not matter, the teleworking

place of business in the developing country is still most likely to be the center of a large city and unlikely to be in the worker's home. Teleworking is a mode of working rather than a type of employment, whereby IT allow work to be carried out at sites away from a company's principal premises.[187] Despite the assumption that women would prefer to work from home so that they can combine paid and unpaid work, most women surveyed do not seem enthusiastic about it. So far, most home-based work is low paying and without benefits; it combines paid and unpaid labor but does nothing to reduce women's domestic burdens. In fact, it can increase stress especially for women with children, as there is no time or physical separation between work and household responsibilities. In surveys women have said that they would prefer working in conveniently located "telecottages" to working at home.[188]

There are some exceptions to telework in major cities, however, which show that contractors in developing countries are beginning to realize that the work that is already remote from its source need not take place in central locations. IT-enabled jobs for women in rural areas have appeared on the remote eastern coast of Malaysia, where young women who are recent secondary school graduates and computer literate enter land records. Contrary to most other rural areas in developing countries, Sarawak in Eastern Malaysia has electricity, good telecommunications links, and enough educated and computer literate young women. Sixteen percent of young women there meet the necessary human resource requirements. Regrettably, in most parts of Africa, the figure would probably be zero percent, and the infrastructure requirements would be absent as well.[189] Basic requirements for teleworking are computer literate workers, reliable power supply, and adequate communication infrastructure. A number of developing countries have made the policy decisions that led to the creation of these inputs. For such countries, numerous teleworking jobs are possible. For those who have not made these decisions, these possibilities will elude them.

Data entry and data capture are at the low end of the skills requirements for teleworking. At the high end of both remuneration and entry requirements is software programming. In between are work in call centers, performing back-office functions, data conversion, medical transcription, content development, deposition summarizing, insurance claims processing, GIS, and networking.

Outsourced software programming has become a major industry in India with software exports already totaling $2.7 billion per year.[190] For programming jobs, companies in India generally recruit college graduates with at least three years of computer experience; excellent English is taken for granted.[191] There are significant numbers of women in software programming in India, including at technical and managerial levels.[192] The prevalence of women in software in India may be due to the fact that so many Indian men with the necessary skills have migrated to the skills-scarce developed countries.

Data entry and processing

Given the high skills requirements for software programming, the lower ends of teleworking such as data entry are more realistic possibilities for large numbers of women in developing countries. Nuim Chowdury has drafted an elaborate business plan for large scale employment of Bangladeshi women in data entry, followed by document processing and warehousing, programming for distributed computing, database management, GIS, and networking.[193] The plan involves training women in the processing of forms, largely for work in fields such as insurance, health, banking, law, surveys, and taxes that are the lifeblood of the service industry. These are activities that are largely unaffected by the current economic downturn that has hit the global technology sector as a whole. Countries that are taking large chunks of the outsourcing markets in similar data processing are the Philippines, Sri Lanka, China, India, Mauritius, Barbados, Belize, the Dominican Republic, Grenada, Jamaica, Mexico, and Trinidad.

The employment generation potential of the data processing area is large. In India, it is expected that 1.1 million people, with at least one-third of these being women, will be working in remote data processing by 2008.[194] The human resource requirements are a computer literate workforce and good telecommunications. Although entering data does not require tertiary education, in India, which has led the world in employment in outsourced data entry, almost all the women in this industry are college educated. That appears to reflect more the high unemployment rate among highly educated women in India than the requirements of the job. Even women who do not know English can do the job. Women in China knew no English but when trained to recognize and enter Latin script characters entered thousands of U.S. telephone directories for Internet and CD-ROMs in 1996.[195] Secondary school completion is not necessary if the accuracy rate is high. Capital requirements to start up outsourcing businesses are low: a bank of PCs connected by a network interface card, a UPS and standby generator, and good telecommunications links are all that are needed. The basic infrastructure requirement is good telecommunications. African women who are computer literate high school graduates could enter this area (from countries such as Nigeria and Kenya where levels of English proficiency are high) if their countries would make the necessary changes in policy to create an enabling environment and put in place the necessary telecommunications infrastructure. It is already happening in Ghana and Uganda where the policy environment is conducive.[196]

Chowdury calculates that women working in data entry in Bangladesh would earn 88 percent more than women with similar profiles working in local jobs.[197] Women trained in data processing could move into more sophisticated areas with some additional training. Other aspects of the field would require higher levels of education.

After data processing, other potential growth areas are data warehousing, a business-to-business application, and call centers, which have similar possibilities and similar prerequisites to those of data entry. Given access to some capital, these are businesses that women who have been employed in this area could start up. The "digital diaspora"—young people with skills in information technology who have migrated to work in developed countries—could help significantly in starting up such enterprises as joint ventures with women in their native countries. The digital diaspora, though almost entirely male to date, has been a significant factor in the growth of information technology in India. It could happen in Africa and Latin America and the Caribbean as well, with stimulus from digital diaspora women on behalf of women in their countries of birth.[198]

Manufacturing

Most knowledge-based manufacturing businesses are located in affluent countries. However, there are opportunities for small scale women-owned manufacturing enterprises in developing countries; these enterprises can carve out niches as subcontractors to large companies in manufacturing modules for computer peripherals and consumer electronics. While such businesses would take considerable capital, there are others that use decentralized production techniques and telecommunications technology that could be established with fairly minimal capital. Manufacture of clothing as well as some kinds of small consumer electronics and publishing fall into this category. Numbers of women, particularly in Asia, have already established such businesses.[199]

Women entrepreneurs entering this area would need to know the demand market as well as have particular expertise and skills. Given the increasing number of women entrepreneurs in small scale manufacturing in developing countries, it would be very useful for women entrepreneurs in developing countries to have training in using the Internet to improve business skills and in identifying entrepreneurial opportunities in the new economy.

E-Commerce

If developing-country women can find niches in e-commerce, this could be very profitable for them—and there are no educational prerequisites. In business-to-consumer e-commerce, the success factors are marketing unique products to consumers with disposable income and managing timely delivery of products. Since such customers are found largely in developed countries, the infrastructure for delivery of goods must be sufficient for the businesses to operate credibly. If the business can deal in nonphysical goods (e.g., music or software that can be sent digitally) or if the goods can be delivered locally in a developing country, so much the better. Since payment is usually made by credit card, women in developing countries often must make arrangements with banks or credit companies abroad to handle these transactions for them.

They also need skilled employees who can design an effective web site for the business. If all these obstacles are overcome, then there are interesting possibilities that women with fertile imaginations can exploit. As Mitter points out:

> Women in the informal sector need to be innovative in finding niche markets, in the same way as the corporate sector, in order to participate in e-commerce.[200]

Numerous small scale businesses in developing countries have overcome significant obstacles to make a success of e-commerce. Some of the most creative initiatives stem from tapping the population of compatriots living abroad. On http://www.tortasperu.com women in several Peruvian cities market cakes for delivery in Peru ("a present for your relatives and friends in Peru") to the two million Peruvians living abroad.[201] Another Internet business that taps the diaspora market is http://www.ethiogift.com, where Ethiopians in the diaspora (primarily in North America) buy sheep and other gifts over the Internet for delivery to their families in Addis Ababa, thus sidestepping the problem of physical delivery of goods abroad. Ethiogift is not a women-run business, but it is one that women in Africa or elsewhere could emulate with minimal capital and skill requirements. Tourism marketing is an area that does not require delivery of a physical product and in which women are fairly numerous among developing country entrepreneurs (particularly as operators of travel agencies). This is an area that lends itself well to global e-commerce and in which developing countries have a comparative advantage (the uniqueness of their tourist sites). Women entrepreneurs might want to consider entering this area.

In a remote village without telephones in Guyana women formed an organization to revive the ancient art of hand weaving large hammocks from locally grown cotton and sent a young member of their organization to Georgetown to get training to create a web site. The weavers' cooperative marketed the handwoven hammocks over the Internet, where they managed to sell 20 at a price of $1000/each, enormous sums by local standards. However, once the regional headmen realized the success of the project, they moved to take it over. This caused the woman who created the web site to quit in anger, and the group is now struggling to get by.[202] ASAFE, whose objective is to help women in Cameroon develop their businesses and obtain technical skills, is now working with its 3000 members to promote e-commerce through a partnership with Chell.com/FutureLink that will market the crafts and other ASAFE products internationally.[203] Networked Intelligence for Development is providing training in e-commerce and Internet for unemployed women in Lithuania in June 2001.[204] Women artisans from the Middle East and North Africa (Morocco, Tunisia, Egypt, Jordan, and Lebanon) are prominent participants in the award winning virtual-souk project, which markets high quality crafts on the Internet and covers the entire production, delivery, and payment chain. This project is now bringing in women carpet weavers of the High Atlas Mountains in Morocco, who have been provided

with microcredit facilities to buy raw materials.[205] Illustrating that e-commerce can help target nearby as well as international markets, the Rural Women's Association of Northern Province in South Africa successfully uses the Web to advertise their chickens to well-to-do clients in Pietersburg.[206]

All of the examples cited above are in the business-to-consumers (B2C) area of e-commerce—arguably the most difficult and the least profitable part of e-commerce. Women who are already in wholesale distribution businesses in developing countries could consider business-to-business (B2B) or business-to-Governments (B2G), both of which offer positive prospects for developing countries.[207] In these types of e-commerce small firms can participate in international ventures.

IT-Enabled Businesses[208]

Information and communications technology presents a number of new opportunities for women-owned businesses. Many of these involve marketing telecommunications services, which presently are mostly phone and fax, but as technology advances and converges, many will increasingly include Internet services as well. In Ghana, a number of women-owned business centers have sprung up that offer fax, e-mail, and other communications services; the majority of clients are also women (in a country where large numbers of women are entrepreneurs, particularly traders).[209] There are 10,000 *téléboutiques* (storefronts where telephone services are available to the public) in Senegal; many of the *téléboutiques* also sell fax, e-mail, and sometimes Internet services.[210]

India has hundreds of thousands of small telecommunications businesses. The Indian equivalents of *téléboutiques* are STD booths, small shops that offer public telephones for long distance calls. These can be set up for capital investments of about $2500. Some 300,000 shops have been created, employing about 600,000 people. According to the International Labor Organization (ILO), women hold nearly half (250,000) of these jobs, which are found in villages and towns throughout the country.[211] Although the jobs pay only about $500/year, they have been created at the relatively low cost of $1250/job, a very low figure. The shops presently offer only telephony and fax but the Indian National Council for Science and Technology is trying to set up facilities with e-mail and printers (STD operators could print messages and have them delivered to users) as well as voice mail, e-mail, paging, and Internet access.[212]

Given the relatively low capital and skills requirements to set up these booths, these are businesses that are within the reach of many women entrepreneurs in developing countries. The demand for these services remains high. Such opportunities should be of particular interest in Africa where teledensity remains very low and where migration is high, creating substantial demand for international calls. Internet kiosks are also appearing in India, particularly

in the south. With access rates of several dollars an hour, these are for-profit, public Internet access sites, which are emerging in virtually every city of size in the developing world, recognizing that home computer access is a phenomenon of affluent societies. While requiring greater investment than STD booths or *téléboutiques*, the Internet kiosks too are prime candidates for women-owned businesses. Suggestions have been made to the domestic IT corporate sector in India that they train women in the necessary technical skills to operate multimedia kiosks and telecenters. Multimedia kiosks are already being set up in several villages in India, but telecenters have not emerged as yet at the village level.[213] These businesses all require an enabling environment, especially liberalization of telecommunications permitting sale of value-added services. In countries with public telecommunications monopolies, such businesses would not be legal.

Grameen Telecom's Village Phone Programme

The best known of the IT-enabled businesses with a high percentage of women owners/operators is Grameen Phones in Bangladesh. The Grameen Bank is an icon of success in gender and development and a model of poverty alleviation, serving as a source of micro credit and literacy training, skills development, and health, family planning, and political consciousness education directed at women. In 1996, the Bank set up Grameen Phones, Bangladesh's first cell phone network. Grameen Phones is particularly noteworthy because of the economic empowerment that it has brought to poor, largely uneducated women.

From among its more than two million predominantly women borrowers, the Bank management selects Village Phone Operators to whom the phone is provided as an in-kind loan. The operators resell wireless phone service (incoming and outgoing) to fellow villagers. Some 75 percent of the operators are women (numbering about 2000).[214] Having women operators promotes women's phone usage because women are more likely to use phones when the operator is a woman. Where women were operators, 82 percent of the users were women; with men operators, women comprised only 6.3 percent of Grameen Bank phone users. More than half of women users (58 percent) said that they preferred women phone operators.[215]

The women phone operators are generally poorer than the average villager is. However, the income that they earn is significant, generally accounting for 30-40 percent of household income and averaging $300/year in a country where average per capita income is $286. The operators are likely to be married (90 percent), and half of them have no formal education. Another quarter has primary education and the remaining quarter, some secondary education. Thirty-six percent identify themselves as housewives, and only six percent have some kind of formal employment (in government or business). The women operate their phone businesses while doing household chores or operating another business. The phones are used primarily for calls relating to

financial matters, particularly relating to remittances, which are a significant source of village income. Strikingly among poor villagers, 38 percent of phone users had one or more family member living abroad. The phones are also used to obtain agricultural price information, thereby improving the position of the villagers in bargaining with middlemen and resulting in higher prices for local farm products.

Most Grameen-provided phones represented the first telecommunications service in the respective villages. In places where the signal is weak, antennas, which serve as an advertisement of availability of public phone services, are mounted on the women's homes. Despite the imminent arrival of fixed wireless phone service in rural Bangladesh, observers feel that the Grameen village phones will continue to be viable businesses because the fixed wireless will probably target more densely populated areas and because village women have become loyal customers of the women phone operators. Grameen Phones has captured about half of Bangladesh's cellular phone market. It is planning technological upgrades to phone cards, e-mail messaging, fax, and Web access through the newly established Grameen Communications, a nongovernmental organization, which plans to launch an Internet service and has started pilot Internet kiosks. Current Village Phone operators are likely to become managers of the expanded telecommunications services.

Village Phones have made women phone clients and phone business operators. They have created a "phone culture" among women by enabling their access to communication tools from which they might otherwise be excluded. They have also shown that poor, largely uneducated women can master the skills and run a small business. Women phone operators have achieved economic and social empowerment within their households and communities. The relatively substantial revenue stream has elevated the women operators' positions in their own households, particularly in decision making. As a result of being a phone operator, better-off villagers come to homes they would ordinarily not frequent, thereby raising the status of the operator.

The advantages of small scale telecommunications businesses for potential women entrepreneurs are that there are no educational requirements, except for minimal mechanical aptitude, and that the capital requirements are small enough to be met through microcredit schemes. Not only do these businesses provide income and employment for the entrepreneurs—they also accelerate development in areas where telecommunications were scarce or nonexistent.

Core IT Sector Employment

According to the ILO *World Employment Report 2001*, the greatest potential for job creation globally is within the core IT sector.[216] As IT usage increases

in developing countries, the design and maintenance of the fundamental IT components will become among the most valued occupations.

Job opportunities in developing countries in these sectors are already available in a few emerging market countries and are anticipated to expand, provided there exists a skilled workforce, political stability, and sufficient IT infrastructure. This currently excludes the poorest regions of Latin America and Asia and much of subSaharan Africa, except for South Africa. In order to attract IT industry, countries will have to offer a conducive business environment.

For developing and emerging market countries a major area for new jobs is in software programming. The ILO argues:

> There are few areas of production, engineering, education, or general services that do not include software as an integral component. While embedded software is at the core of machine tool industries, vehicles and electronic products, customized software has driven the computerization of routine operations and management of banks, government services, and management of large operations.[217]

India, Brazil, China, and Costa Rica are examples of countries where software industries for export have developed.[218] As discussed earlier, there are significant opportunities for women in software, and we have seen that women are already active as software developers in several key emerging market countries. Women with a college education, good analytic ability, and proficiency in an international language are qualified for these jobs.

Network administration and maintenance is another area for which there is already demand within emerging market countries among private sector and government institutions that need skilled personnel to manage their networks. As more governments and firms begin to integrate IT into their systems, network skills will come into greater demand. Qualifications for networking professionals include specific training in the development and management of networks, for which a minimum of eighth grade literacy and numeracy and proficiency in a major international language is sufficient. Women with this background are qualified for networking professions, and yet, as discussed in the preceding section on "The Impact of IT on Women's Work" (pp.37-48), networking occupations are often viewed as more appropriate for men, because of the perceived physical demands of network and computer maintenance. Few women are represented in this field as of yet. While there is undoubtedly a physical element to networking, interviews with female network technicians in different cultural contexts, including Latin America, Africa, Eastern Europe, South Asia, and the Middle East, suggest these demands do not pose problems for all women.[219] Rather, long hours and traveling off-site are among the factors that prevent women from taking advantage of opportunities in network and systems maintenance.[220] Within the field of networking, women may be interested in jobs in network

management, rather than network support and maintenance that involve erratic hours and traveling to provide support to clients.

More job opportunities may exist for women in IT education and training, as education is traditionally a female field, and the flexible hours of a trainer may appeal more to women with families. Interviews with women participants in a networking training course in India highlighted women's interest in applying their technical skills as trainers rather than as technicians in the industry, due to the trainers' more flexible work schedules.[221] This follows the pattern emerging in South Africa, where women are most represented in IT education and training (39 percent) followed by sales and marketing (36 percent).[222]

Romanian social workers learn how to access the online course "Foundations of Social Work."

Efforts can be made to increase the demand for and the supply of women in formal IT-sector occupations beyond those perceived as culturally acceptable for women. Strategies can be utilized to reach employers, families, and women themselves. Girls and women need to be informed about the well-paid job opportunities for which they could qualify. Career fairs at secondary schools promoting IT careers and training institutes and campaigns and outreach by vocational colleges that offer IT training have been effective in generating interest and demand for IT training programs among middle class women in South Africa.[223]

Employers' provision of affordable housing through hostels, families, or shared flats with other young women could help overcome the obstacles of young women finding housing in urban areas. Some larger firms already provide housing for their employees—this practice could be expanded through cost sharing between the private sector and government. Schools could also offer counseling to parents and husbands that addresses their possible concerns regarding security or inappropriate behavior, to increase their support for their daughters and wives working in the IT sector.[224]

Employers can also be encouraged to hire women workers. Following the introduction of government policy encouraging the employment of women in South Africa, instructors from the Peninsula Technikon vocational institute say IT firms are approaching the school for its female graduates even before the women have completed the program.[225] Colleges and vocational institutes that liaise with recruiters and potential employers of their students can also

raise IT companies' awareness of the high skills and value of female IT employees to combat any stereotypes within the industry that female candidates are less qualified for IT positions.

Information technology has the potential to facilitate many jobs and entrepreneurial opportunities for women in developing countries. But women cannot do it themselves. IT policy must take gender into account to provide an enabling environment for women, and gender policy must take account of the opportunities that IT can bring. The country in which they are living and working must have good telecommunications infrastructure and an enabling environment that will attract jobs that women can fill. And, for women to take full advantage of IT possibilities, especially in the formal sector, they need better education. More opportunities with fewer requisites are available in the informal sector, but there women need credit and business management skills in addition to a modicum of technical skills. These requirements will be discussed in the section on "Ensuring Women's Ability to Take Adv ntage of IT" (pp.75-96).

POLITICAL EMPOWERMENT OF WOMEN THROUGH IT

Over the last 20 years, the world has seen a movement, albeit fragile in many developing countries, toward democracy based on broad citizen participation in public decisionmaking. When women's participation in such decisionmaking is limited and restricted, it weakens a society's democratic foundations. Conversely, increasing women's participation in public life strengthens fledgling democracies.

Strengthening women's participation in public life covers a huge territory. This includes: reduction of poverty that leaves women without time for politics, eliminating illiteracy, supplying information about women's legal and political rights and about political processes, and ending the violence against women that keeps them from speaking up at all. In order to participate fully and effectively, women need an introduction to basic political concepts, and women's groups need help in increasing their membership and expanding their range of political activities. Potential female candidates need training to run political campaigns and those women in office need help in carrying out their duties effectively.[226]

Women's involvement in political life is generally low in developing countries. Worldwide, women represent only 13.8 percent of elected legislators, and they remain underrepresented in most national and international administrative structures.[227] The number of female legislators is particularly low in many developing countries—for example, in Kenya, after the 1997 elections, only three percent of members of Parliament were women, a decrease over previous years.[228]

IMPROVING GOVERNANCE

Information and governance are very closely linked. Information and knowledge are the bases of informed decisionmaking. When information is not accessible to all, those who don't have it can be exploited. One of the hallmarks of women's situation in developing countries, particularly among poor women and most markedly among poor women in rural areas, is their information poverty, which reflects the general disparity between men and women in terms of access to all development resources. If information is power, lack of information is disenfranchisement.

IT and Governance

The application of information technology to improving governance is known as digital or electronic governance (e-governance), a process that is also described as electronic democracy. Its advocates feel that IT and improved governance are a natural pairing because they share the attributes of being decentralized, pluralistic, democratic, and empowering rather than controlling,

and because they foster debate. Electronic democracy aims to ensure that citizens are no longer simply passive consumers of services offered to them, but rather deciders of the kinds of services they want and of the best ways those services should be delivered. At the Global Knowledge II Conference in Kuala Lumpur in 2000, the Women's Forum urged women to be active in e-governance and recommended the design of community portals through which women could share knowledge and information relevant to their homes, work, and communities and participate in local politics and decisionmaking.[229]

IT is extremely useful in the movement toward democratization and citizen empowerment in developing countries because it can help establish more transparent online government, enhance interaction between government and citizens, revitalize civic institutions and public debate, promote equity, and empower minorities.[230]

IT FOR THE POLITICAL EMPOWERMENT OF WOMEN

> Women should be empowered by enhancing their skills, knowledge and access to information technology.[231]
>
> Women can use IT to work together, gain peer support, campaign effectively, and share, control, and use information to further their interests. IT will thus also enable women to be proactive and introduce their own perspectives when publishing and propagating issues, opinions and experiences.[232]

As pointed out above, there are many ways in which IT can enhance the political empowerment of women. In the following discussion, we focus on the use of IT:

- To end women's isolation and give them a voice
- As a tool for networking women for social and political advocacy
- To strengthen women's participation in the political process
- To improve the performance of elected women officials
- To improve women's access to government and its services
- For education
- For the dissemination of indigenous knowledge

Ending Women's Isolation

IT is uniquely beneficial to women's empowerment in developing countries by helping to end their information isolation, a phenomenon from which women suffer most. As Anriette Esterhuysen, Executive Director of the Association for Progressive Communications, remarked:

> Women in Africa are marginalised, geographically dispersed and lacking in access to the processes of governance. To achieve political emancipation women need to acquire the skills that enable them [to] access, publish and propagate issues, opinions and experiences from

> their own perspectives. Emancipation is a political process that requires organizing, strategizing, accessing information, lobbying and advocacy. IT offers networking, creating peer support, campaigning and sharing of information—spaces that women can control and use to further their interests.[233]

In their isolation, women depend on traditional and local sources of political and civic information—particularly their husbands and fathers. Women's use of IT can bridge their geographic isolation and promote interaction, networking, sharing, and formulation of common strategies to address their interests.[234] If women are to become active participants in governance and become informed citizens, they need objective information. IT allows women to communicate with each other—locally and internationally—without travel and without respect to time constraints. IT makes possible the expansion of the individual's range of vision. Without IT a woman's range of vision is usually local or, at best, national. With IT comes the relatively easy possibility of global vision and global contacts.

Networking

We have noted that networking is the most common usage of IT among women in developing countries. Networking can be employed for many purposes—social networking, networking to further one's business, and networking for political advocacy. In this analysis, we examine electronic networking as a tool for the political empowerment of women in developing countries.

A Brazilian teacher in an USAID-supported LTNet program networks with colleagues

> Worldwide, women are putting IT to work for the movement [for women's rights and empowerment]; communicating among dispersed networks, mobilizing action in times of crisis, participating in policy debates and voicing new perspectives. Information and communications have always played a vital role in the women's movement. Electronic communications are facilitating women's networking and advocacy in ways not previously possible. [235]

IT enables women to find allies across communities, nations, and regions. The technology also helps them expand their horizons and help them feel that they are part of a larger process. As one woman from Latin America said "from my computer screen, China seems closer."[236] Women have been using IT to network on a national, regional, and international basis to build solidarity on numerous issues in every region of the world. The obvious benefits are bringing individuals together from diverse cultures, gaining

knowledge, and sharing information. In the most sanguine view, some also see networking using new technologies as a tool to create "a more gender-equitable global culture."[237]

As noted in analysis of "The Current Situation" (pp.13-25), the Fourth World Conference on Women (Beijing, 1995) was the major watershed in realizing the power of information technology as a tool women could use for mobilization, information exchange, and empowerment.[238] A tremendous number of women from all over the world worked together electronically to influence the work of the Conference. Nearly 160,000 persons accessed documents from the official website of the Conference; another 100,000 visited the main nongovernmental site.[239] This is an account of how women worked together on the Conference issues using IT and the empowerment benefits they reaped:

> Using e-mail, Gopher, conferencing and, to a lesser extent, the WWW, women accessed draft versions of the Platform for Action, regional action plans and caucus documents. They downloaded them, disseminated them, analyzed them, drafted additions and deletions, reached consensus on issues, circulated statements and mobilized support. NGOs in some countries found themselves better informed than their national delegations. The public electronic spaces for discussion and information sharing also helped demystify UN proceedings. Discussions previously reserved for a few governmental delegates and observers at the United Nations were now open to anyone able to access the medium.[240]

The Internet was used to exchange information and prepare participation to influence the formulation of the Platform for Action by Governments and to shape the strategies of NGOs at the Forum. The women used, and continue to use, many different IT tools including e-mail, conferencing, World Wide Web, CD-ROM and diskettes, information gateways and portals, fax servers and fax trees, discussion lists, and connections with traditional media. The virtual community that developed around the Beijing Conference that included governments, international organizations, and NGOs now constitutes an international electronic network working for women's empowerment that could be mobilized according to need and interest.

Since Beijing thousands of women's groups are now networking online for political advocacy. Virtual Sisterhood is notable among the thousands because of its global aim to be a network for women around the world to share information, advice, and experiences. It operates in all the six official languages of the United Nations plus Japanese and German and has secured substantial participation from women in developing countries.[241] NGOs in particular have found the Internet a very useful instrument to increase their impact and generate support locally, nationally, and internationally.[242]

In addition to the regional groups discussed in the section on "The Current Situation" (pp.13-25), some new groups have recently joined the online

advocacy for women's rights. Arab Women Connect, operating out of Jordan and sponsored by UNIFEM, came into existence in February 2001 with a website, e-mail list and electronic newsletter.[243] Although quite subtle in its approach, it still manages to question official Arab governments' positions on women, supporting Lamis Alshejini's point that women working in NGOs in the Arab world can express views on the Internet on politically sensitive topics that would be otherwise impossible to raise.[244] Another new entry on behalf of women's rights is the Latin American and Caribbean Committee for the Defense of Women's Rights.[245]

The conclusion of the Expert Workshop on Global Information through Computer Networking Technology (1996) was that women should position themselves to use the new communication technology to articulate their interests and promote their causes, both locally and globally.[246] Doing so will bring major gains for their political empowerment.

Strengthening Women's Participation in the Political Process

IT can strengthen women's participation in the electoral process. IT could help particularly in getting information to women voters in rural areas:

> During the 1991 Zambian elections, one of the difficulties in the electoral process was communicating vital information to voters, especially women in rural areas who knew nothing about civic education, voter rights, etc. If at the time computers were strategically placed throughout the country people could have obtained relevant information for their political emancipation.[247]

Women's groups could create online sites to make it easier for women to get the information they need as voters; women would access through public sites, such as telecenters or community centers.

IT increases the number of ways in which women can participate directly in politics and civic life. As we have seen, they are not well represented in conventional ways (elected and appointed offices and senior government jobs). As Vikas Nath says:

> The new models of governance open up avenues for direct participation of women which so far has been limited to representative forms of participation in which women were insufficiently represented. These models would lead to a more interactive and proactive form of communicating with officials in the local governance spheres in a process which will lead to greater transparency and accountability of their actions. The notion of distance and time would become meaningless as the technologies have the capability of working at all times and from all geographical locations. It also means that women in rural areas for whom time is a scarce commodity and for whom it is absolutely impossible to commute to public offices—the new technologies would enable them to leapfrog to an altogether different platform where they can voice their opinions and communicate to the

concerned person without additional burden on their time or commuting large distances.[248]

In India the Self-Employed Women's Association organizes electronic discussions through *panchayati raj* (village governance institutions). In these discussions, village women often pose questions that are answered promptly by a panel of experts. Through translation modules, responses go to the women in their vernacular language.[249]

Improving the Performance of Elected Women Officials

IT can also help women who are elected to office. A member of parliament (MP) in Zambia spelled out how IT would help her perform better:

> The use of the Internet as a source of information for women within the democratization process is a positive idea. As a female Member of Parliament, it would assist me to research and access information on various issues concerning women and obtain information from other parliaments around the world. If I [had access to the Internet] it would greatly enhance my work. The knowledge and skill I have acquired on the use of the Internet has been helpful in informing me about what is happening in other countries and enlightened me about various issues.[250]

Women MPs have used e-mail to build solidarity with other female MPs in South Africa and West Africa.[251]

IMPROVED GOVERNANCE

IT is also particularly useful in increasing the transparency and accountability of government, an application from which women can particularly profit.[252] Two examples demonstrate how women used IT to call upon a national government and a local administration for greater accountability and transparency. In 1999 when a devastating cyclone hit southeastern India killing hundreds of people, women in India found out from the Internet that the scale of the disaster had been made worse by negligence and ill-preparedness of the State government disaster mitigation agency. They became active in calling the Government into question on this matter. Also, when women students in Bangladesh faced administrative inaction in response to increasing instances of campus rape, they publicized their situation on the Internet. The resulting international and national response pressured the university administration to conduct an enquiry.[253]

Improved Information Flows and Service Delivery

IT can improve information flows among government, politicians, and citizens.

It is not only critical that voters have access to information during elections, but also there must be consistent information flows from voters to politicians

and vice versa—otherwise the process becomes meaningless. The use of IT can address this.[254]

The critical flow of information needs to be not only from politicians to voters and vice versa, but also to and from government. This could be done through public information terminals (PITs) such as those that the Department of Communications in South Africa is introducing throughout the country to provide government information on a 24-hour basis and to allow citizens to process government forms, thus promoting better service delivery.[255] Through such terminals or through government web sites, women could learn the names of local officials, their roles and responsibilities, and the working hours of government offices. They could download application forms and rules and regulations. Such information would clearly improve women's awareness of and interest in governance issues.[256]

EDUCATION

IT offers invaluable tools for women's empowerment through education, particularly literacy education, continuing education, nonformal education, and lifelong education, all of which combat illiteracy and women's other educational underachievement. This, too, is a task for community information centers, and something that IT could take on more cheaply than any other medium. This will be discussed in greater detail below.

INDIGENOUS KNOWLEDGE

IT can also help empower women through codification and dissemination of their indigenous knowledge. As gender roles root women in their communities, they are particularly aware of their social, economic, and environmental needs. Traditionally women have been the incubators and transmitters of knowledge relating to food processing, preservation, and storage, the growing of specific crops, nutrition, and health. Much of the knowledge that women in rural areas possess has scientific value. IT can help organize and transfer this knowledge to outside communities that might benefit from it.[257]

A student teacher at a bilingual educational technology center in El Quiché, Guatemala

Ongoing Projects

There are a number of ongoing projects in developing countries that use IT to promote women's political empowerment. The USAID-funded project Leadership and Advocacy for Women in Africa (LAWA) recruits, selects, and trains female lawyers from Ghana, Tanzania, and Uganda who are interested in advancing the cause of women's rights upon returning to their respective countries. The project encourages the lawyers to use IT and trains them in Internet and e-mail use. It also makes funds available for them to purchase computers and set up e-mail accounts upon return to their home countries. However, Africa's infrastructure problems have posed difficulties for several of the LAWA fellows in being able to use the new media in their own countries.[258] Nevertheless, LAWA sees the sharing of information among these women as vital to the pursuit of women's rights in Africa.

The Women and Governance project in Kakamega and Makueni provinces of eastern and western Kenya was established in 1999 to increase women's civic awareness in rural areas. Prior to this project politicians tried to buy women's votes, exploiting their lack of political awareness. Funded by the International Development Research Centre, the project tries to inform women about electoral issues, promotes interaction with women in nearby countries, and generates, stores, and exchanges strategic information with the aim of enabling women to make informed decisions and participate effectively in the electoral process. Working from community centers, the project trains rural women, many of whom are illiterate, to use computers to retrieve information, exchange information with others, conduct personal business, and prepare training materials. Of the project participants, more than half had only primary education and one-third were illiterate. Fewer than half had ever used a telephone, and only one woman had ever used a computer before. In order to make the project sustainable, it provides communication services for others at a fee.[259]

The major aim of the Radio Listening Clubs in Zimbabwe, discussed in the section on "The Impact of IT on Women's Work" (pp.37-48), is women's civic education. Women gather at the community center to listen to a program related to civic and political life and then discuss it.[260]

Women'sNet in South Africa was set up in 1998 with the aim of fostering women's use of information technology for policymaking and advocacy. The program tries to enable South African women to use the Internet to find resources for women's social action. The Women'sNet web site has news concerning African women, jobs, human rights, health, combating violence against women, and new technologies. It provides training in computer and Internet use for its target clientele including gender specialists in legislatures, local and provincial governments, and government line departments; people working on women's and gender issues in nongovernmental organizations; and membership-based women's organizations. When there is a government gazette announcement inviting public submissions on a bill, Women'sNet

posts the announcement on its web site and provides women with information on how to contact the relevant parliamentary committee.[261]

The Forum for Women in Democracy (FOWODE) provides information and information services for women parliamentarians in Uganda. FOWODE responds to information requests from parliamentarians, runs a listserv to which the women politicians respond, and links up with other organizations with similar interests in the region. Women parliamentarians can use this information to contribute to parliamentary debate and to investigate the issues when a new bill is being considered. It also has arranged computer training for members of Parliament. In addition to supporting women in office, FOWODE aims to provide women with skills to increase their participation in decisionmaking, to educate women about civic rights, and to provide a forum for women to influence public policy. FOWODE also encourages the collaboration of women leaders in East Africa and internationally through electronic networking.[262]

A family in Asela uses their home computer, an unusual home appliance in rural Ethiopia. (This study's author Nancy Hafkin is standing on the right.)

Getting IT to women, particularly in rural areas, in developing countries will be a difficult and mammoth undertaking. However, given the possible opportunities and advantages that could accrue, particularly in empowerment, the obstacles are worth the effort to overcome. Information and communication technology means more to the empowerment of women in developing countries because the alternatives are fewer and more expensive. Women in developed countries have many alternative sources of information for their empowerment; women in developing countries do not. Women in developing countries value the information they get from the Internet very highly because they have few other sources. Women in developed countries can use the telephone and send letters that they can expect to be delivered. For women in developing countries, either there is no telephone or it is too expensive to use, and the post can take years to reach the addressee if it gets there at all. Women in developing countries and parts of Europe and Eurasia who have access use e-mail to establish new contacts for lack of alternative means. Women in developed countries tend to use it to maintain existing contacts.[263] Computer literacy is becoming an indispensable tool for organizing and mobilizing communities throughout the world, and women need to use these tools. In the next section we will look at ways and means that can facilitate women's access to IT, which is becoming increasingly important to them.

ENSURING WOMEN'S ABILITY TO TAKE ADVANTAGE OF IT OPPORTUNITIES

Information technology can offer significant opportunities in developing countries for virtually all girls and women, including poor women living in rural areas. However, their ability to take advantage of these opportunities is contingent upon conducive policy and an enabling environment in their countries to extend communications infrastructure to where women live and upon raising their educational level. Out of enlightened self interest women in developing countries need to involve themselves in the area of information and communication technology policy and regulation. Girls and women must acquire literacy and basic education to be able to fully utilize new technology. More girls and women need to enter scientific and technological studies so that they can participate in information society at all levels. The final element is finance. In considering entrepreneurial ventures associated with information technology, women need access to capital. This section looks at ways to ensure the equitable participation of women in the information age.

ENGENDERING IT POLICY

Most developing countries have come to realize the need for policies on information and communications technologies to guide the development of their national information infrastructure. A number of countries have already elaborated such policies, including some, such as Brazil and Morocco, with notable success.[264] In other countries, the process is underway but not completed. Most African countries, for example, are in this category.[265] Still other countries are aware of the importance of policy development in this area but have not yet begun the process. The fact that these policies are in the process of being elaborated or about to be started in most developing countries is advantageous for women to get in on the ground floor of IT policymaking so that gender can be considered in the early stages.

To date, developing countries have implemented few concrete policies to promote gender equity in using IT. Most concentrate on competition and investment policy, technology, regulation, and rural access. Generally within the country, the ministry of communications or the ministry of information technology, where there is one, takes the lead in IT policymaking, often with the assistance of the national telecommunications regulatory body, which reinforces the technical aspects of the exercise.

Social Aspects of IT Policy

Concentration on the economic and technical aspects of IT policy development may ignore the enormous social and economic impact of telecommunications and information and communication technology. The Buenos Aires Declaration on Global Telecommunication Development for the Twenty-first Century

stated that telecommunications are an essential component of political, economic, social, and cultural development and the basis of the global information society.[266] As has been the case in many other policy domains (e.g., agriculture, health, education), policies that are ostensibly gender neutral can become gender discriminatory when implemented in a socioeconomic environment already pervaded by gender discrimination. Information and communication technology deals with the dissemination of resources among different groups of users and sectors. In any such exercise, priorities need to be established. Thus, even if not explicit, gender is an implicit component of any such exercise.

From the gender perspective, the essential question is whether gender equity is an explicit objective or an underlying principle of the IT policy and strategy. Even policies that consider social elements, such as universal access and ensuring reach of communications to rural areas, can be gender blind if the exercise is treated on the macro level without disaggregating by sex. [267] Without explicit gender analysis and incorporation of the results into policy instruments, it is unlikely that the results will have positive impact on women. The benefits of IT may bypass women even if their countries develop adequate information infrastructure and service delivery.[268] Awareness of this first appeared on the international scene with the ITU-sponsored World Telecommunication Development Conference, held in Valletta, Malta, in the first quarter of 1998.[269] A number of papers delivered there made the case for the connection of gender and telecommunications with an emphasis on new information technologies and led to the establishment of the ITU Task Force on Gender Issues. Since that time there has been increasing literature and growing awareness of the importance of engendering IT policy, particularly in developing countries.

Despite the increased awareness, there are very few places where policies reflect this awareness.[270] Examining IT policy instruments in four African countries (Mozambique, Senegal, Uganda, and South Africa), Marcelle found that only the South African Telecommunications Act of 1996, which predated the Malta Conference, included provisions to redress the gender imbalance in access to telecommunications. However, not much has been done regarding gender in the implementation of the Act. In the remaining three countries in this group that undertook IT policy work since 1998, there was no treatment of social issues in Mozambique and Senegal, with the focus being almost exclusively in operator performance and sector structure, while Uganda paid attention to increasing service to rural areas, but made no explicit references to gender.[271]

Recognizing the needs and perspectives of women in IT policy can help ensure the active participation of women in policy discussions and lead to the increased contribution of IT to socioeconomic development. When women have access to information technology, they can engage in a variety of productive tasks, including entrepreneurship and management of SMEs.[272]

Thus, development goals and gender goals can advance at the same time. According to Sonia Jorge:

> There need not be any inconsistency, however, between gender specific objectives and development objectives; on the contrary, it is becoming increasingly apparent that one of the most effective means to provide access to both telephone and advanced information technologies to unserved and lower income areas and populations is to encourage the development of micro, small or medium size telecommunications businesses owned and managed by women.[273]

Gender Concerns in IT Policy

Although IT policy formulation is often conducted as an exercise where gender has no place, gender is a very relevant concern in many of the areas under consideration. And, although IT policy and strategy varies considerably from country to country, most policy and policy instruments deal with similar issues. The gender concerns in a number of ostensibly technical IT policy areas are outlined below.

Network architecture and deployment (choice of technology). This is the most technical area, and the one most often left to technical experts. Yet, this area raises the most gender concerns. The most basic IT concern for poor women in developing countries is whether they can afford the technology choices that are made. Thus the gender focus should be on building network infrastructure for the majority and not on expensive high capacity specialized access that caters to a wealthy minority. Technology choices (such as fixed wireless as opposed to fiber optic cables for telephone) may be less costly alternatives that could result in lower tariffs for women users, particularly those in rural areas. Technology that may be too complex for illiterate or semi-literate women, including SME entrepreneurs, is also a matter of concern. Gender advocates should work to promote infrastructure investment strategies that provide basic infrastructure in all areas, specifically rural and periurban areas where poor women tend to concentrate and which are notably lacking in access to IT. Women can advocate the development of interim strategies such as mobile phones or rental mobile pay phones to provide access in rural areas or areas with little access. Choices of customer-premise equipment should be examined carefully. To suit the conditions under which most women live, this equipment needs to be rugged, low maintenance, and robust under fluctuations in power supply.

Pricing and tariff issues. The major issue in pricing and tariffs is whether costs passed on to women consumers will be affordable. Will rates be the same or higher in rural areas where most women live? Gender equity advocates should promote the development of incentive programs to increase access and pricing policies to stimulate expansion and increased use in previously underserved areas, where women predominate.

Licensing issues (ownership and control). Are women provided the same opportunities as men for ownership and control of licenses and IT-related businesses? The possibility can be considered of granting a certain number or percentage of information technology licenses to women-owned businesses. Will sex-disaggregated statistics be collected on licensees? Information on licensing opportunities should be made available at locations that women are likely to access. Granting of licenses could contain conditions such as the establishment of training programs for women technicians.

Strengthening technology innovation (R&D). Efforts are needed to assure that women are among those who work in technology innovation. Scholarships and grant programs for women in science and technology can be created, and some of the available places in research training programs could be reserved for girls and women. In R&D attention should be given to the design of equipment that takes into account developing countries' conditions and constraints of particular relevance to women, such as literacy levels and languages.

IT-enabled private sector business development. The major gender concern is for women to be aware of these opportunities and able to compete for them under transparent conditions. Encouragement for women as owners and/or managers of telecenters and other value-added IT services is of particular interest.

Human resource development for system support. The objective on this issue is to ensure the presence of girls and women among the technologically trained. Girls and women should have equitable access to training at all levels, including system design, networking, software development, content creation, web development, information management, maintenance, and system management. Hiring opportunities at all levels should be equitable for men and women. Campaigns could be developed to attract and retain women professionals.

IT labor force participation. Girls and women should have access to jobs at all levels, not just low-paid entry-level jobs. Women should make planners aware of both labor force and entrepreneurial opportunities in outsourcing and other IT-enabled businesses.

Data infrastructure. Policy in this area should ensure the involvement of women in content creation, especially content that is relevant and accessible to as many women as possible in the country.

Facilitating access to IT networks, including universal service obligations. Focus should be on the promotion of public access over individual household access and extension of service to rural and other underserved areas. Gender must be considered in discussions of universal access schemes. Linkage of traditional and new technologies should also be considered. In the establishment of telecenters and other public access

points, attention should be given to time and location constraints that women face.

Sex-disaggregated statistics on access and use, incomes, differential impact of costs and technology choice, and on employment and entrepreneurship in various IT fields are needed for effective engendering of IT policy. As we have seen earlier, these statistics are rarely available. A recent memorandum of understanding by ITU, UNIFEM, and UNU/INTECH to promote the collection and dissemination of such statistics should be helpful in collecting and disseminating these data.[274]

The Policy Elaboration Process

Gender needs to be taken into account explicitly not only in the **content** of IT policy, but also in the **process** of policy elaboration, implementation, and evaluation. Following principles of equity and inclusion, women and men committed to engendering IT policy should be members of the national task force that is established to develop IT policy or strategy. Representatives of women's organizations and units from government as well as civil society should participate in the entire process from planning through implementation, monitoring, review, and evaluation. In South Africa, for example, Women'sNet, the African Information Society Gender Working Group, and the Gender Unit of the Department of Communications have all been active in organizing women to become aware of the issues and to participate actively in the making of national IT policy.[275] In Zimbabwe, the Media Women's Association (FAM-Zimbabwe) organized women to advocate the consideration of gender in the national telecommunications policy.[276] In order to take on these tasks that will put them in regular contact with technical IT experts, women must understand their own information needs and develop sufficient technical knowledge to be credible advocates of their views in policy debates.[277] As Nidhi Tandon points out, women need to find out who is setting telecommunications and networking policy in their countries and make this information available to other civil society groups.[278] Gender advocates will need to sensitize all stakeholders to the significance of gender for the development of IT and its positive impact on development.[279]

Guides and other materials are available for women's groups that want to get involved in engendering IT policy. Of particular note is "Engendering IT Policy" produced by the African Information Society Gender Working Group and "Gender Perspectives in Telecommunications Policy: A Curriculum Proposal."[280]

Sonja Jorge has compiled a table that very effectively illustrates the differences between a "gender neutral" and an engendered approach throughout the policy process on universal access.

Table 3
Comparison between gender neutral and engendered policy process for universal access[281]

Policy process steps	"Gender neutral" approach	Engendered approach
Problem definition	Focus on macro statistics such as number and percentage of households with telephone, average distance to access	Looks specifically at telephone penetration by gender, by female-headed households, average time and distance to telephone access, location of phones
Definition of goals and beneficiaries	No specific mention of girls and women	Explicit mention of girls and women, particularly those with low incomes and living in rural areas
Formulation of policy options	Policy to increase number and percentage of households with telephones, promote development of telecenters	Same, but also to increase number of telephones per female-headed household, decrease travel time to access a telephone, locate telecenters easily accessible to women, and promote women as owners and managers
Choice of preferred option	Focus on overall impact	Focus on overall as well as gender-specific impacts
Enforcement of new policy	Develop support from consumer-advocate groups, ministerial authorities, and operators	Additionally, develop support from women's organizations, gender units in policy and regulatory agencies, and grassroots groups involved in communications access
Implementation of policy decision	Define implementation modalities and administer process for compliance	Implementation process should be gender aware. Ensure participation of women's support groups so that implementation achieves goals set forth
Evaluation and monitoring	Process based on baseline statistics and quantitative methods	Based on overall and sex-disaggregated statistics and goals and qualitative methods of analysis; analysis of not only whether women benefit, but which women do so (class, age, rural/urban location, race).
Termination, renewal, and revision	Decisions based on overall, macro-level impacts	Decision based on overall and gender-specific impacts

Bilateral agencies have an important role in assisting national governments in developing countries in advocating the inclusion of the gender dimension in IT policy and planning, as an integrated part of the entire policy process from its inception. This might be done by providing a gender adviser in undertaking national IT assessments and in IT policy elaboration.

Women need to get involved in engendering IT policy not only at the national level but at international levels as well, including at the level of the World Trade Organization, the ITU, and other bodies that deal with the future and governance of information technology. According to the APC:

> Women's and citizen's groups do not have a voice in the negotiations which will influence national and international legislation [related to IT], and therefore their access to technological and information resources. It is therefore imperative to create mechanisms for them to formulate and defend their needs and interests.[282]

This section has examined why and how to include gender dimensions in IT policy. In order to ensure women's ability to take advantage of opportunities presented by information technology, an awareness of IT and its possibilities must also be part of gender policy at national and international levels. Gender and development policymakers need to be sensitized to IT issues. Policy activities aimed at promoting gender equality should include a focus on how IT can be used in the process. As Esterhuysen points out:

> If a government is making a law that tried to address the issue of violence against women, the people who draft the law should make use of IT to get the input of women's organizations at the drafting stage, and, once the law is made, use IT to disseminate information about the new laws to women everywhere.[283]

In addition to using IT for advocacy and information dissemination, gender policy advocates need to be aware of the job creation and entrepreneurship possibilities that IT can bring to women. IT and gender policymakers need to enter a dialogue so that IT programs meet the needs of women and so that women-targeted programs contain IT training and awareness. Too often even within a single bureaucracy there is stove-piping of concerns so that the units for IT and development planning and those for gender-related programs have little or no contact with each other. Cross contact is essential for the full realization of the opportunities that IT can present for women in developing countries.

Women have great self-interest in many of the economic aspects of IT policy. Without IT policies (and related macroeconomic policies) that encourage telecommunications growth, regulatory reform, foreign direct investment, and a conducive enabling environment, jobs will not come to their countries. As women occupy a significant number of IT-related jobs that provide much better than other industry wages, it is in women's interest to work for the adoption of liberalized IT and related policies. The most important point, though, is that the policies are being elaborated now. Action to ensure that women's issues and concerns are considered in IT policy will provide many opportunities for women's empowerment. The time is ripe for action now in many developing countries.

IMPROVING WOMEN'S ACCESS TO IT

Increasing women's access to information and communication technologies in developing countries involves increasing availability of communication in areas where women live, since most women in developing countries live in areas that are presently underserved. Extension of infrastructure, particularly wireless and satellite communications, to rural areas and peri-urban areas is crucial to increasing women's access to information technology.

Public Access Strategies

At the end of the last mile, the emphasis needs to be on common use facilities. Perhaps the most sustainable strategy for public Internet access is the market driven, locally initiated service model. Peter Benjamin has identified the small scale, locally driven phone shop as a potentially sustainable model for providing Internet access in developing countries. Benjamin points to Senegal where thousands of phone shops, offering primarily telephone services, and to a lesser extent, fax and photocopying, have started up, with support from the telecom, SONATEL, to meet demand for domestic and international phone service.[284] Many of the customers are women. Such phone shops are already profitable, and while most do not yet offer Internet access, they could gradually scale up to offer additional services as demand increases. The phenomenon is also well developed in Ghana, where women are prominent among the owners and operators. Other public access communication facilities (which could be adapted to Internet access) include teleports and STD Public Call Offices in India, mobile payphones in India and Bangladesh, "wartels" in Indonesia, and *téléboutiques* in Morocco. In Peru, *monocabinas* are franchised low cost, public Internet access points.[285]

"Communications shops" of all varieties hold particular opportunities for women's access. They are conveniently located within communities, women are already using them for phone calls, and as proposed in the section on "Opportunities for Women's Economic Empowerment" (pp. 49-64), women could be hired as managers or be given training and capital to launch them as businesses, which would in turn attract more women customers. This strategy combines women as consumers and as entrepreneur-managers, providing both IT access and income generation opportunities for women. However, these opportunities exist only where government regulations allow resale of communications services.

A more sophisticated, and costly, approach to community communications access is telecenters, which come in many varieties from upgraded cybercafés and telephone shops to Multi-Purpose Community Telecenters. However, telecenters tend to be expensive and are often dependent on donor support. Few have become sustainable on their own. Among those that have proven successful is the NIIT network of 100 "Learning through Exploration, Discovery and Adventure" (LEDA) Family Clubs in India, fee-based multimedia centers that combine Internet access with computer-based learning facilities. Women manage many of these centers, and fathers, mothers, and children come together to use computers, tap into the Internet, and receive training.[286]

In addition to single purpose telecenters, public access communication facilities can be located in or near institutions that women frequent such as schools, markets, health clinics, post offices, or even beauty salons. For school age girls, the World Bank's World Links for Development (WorLD)

program that provides Internet access and computer training in secondary schools in developing countries has been successful in reaching young women. An evaluation of the program in five countries in Latin America and Africa showed girls doing as well as boys in "ability to communicate with others, to write reports, find and analyze information, and use computers, software, and the Internet."[287] Facilities located in schools might be opened to community residents after school hours and on weekends.

Mobile units are also being used to provide communications to underserved communities and institutions. These units could reach homebound women as well as women in remote areas or those who are economically or socially detached from the mainstream. Mobile access strategies are already being used to target women in rural communities. The Fantsuam Foundation in rural Nigeria uses Mobile Community Telecenters (MCTs) equipped with satellite and wireless Internet access to provide Internet access to community members and training for health workers. In response to initial resistance from health workers to using new technology, the program worked with the health training institutions in the area to make the training more appealing.[288] The vans are also used in Malaysia to bring advanced information technology to schools without these facilities.[289]

IMPROVING GIRLS' AND WOMEN'S ACCESS TO EDUCATION

Women librarians at a United Nations Economic Commission for Africa session learn Internet searching techniques

The single most important factor in improving the ability of girls and women in developing countries to take full advantage of the opportunities offered by information technology is more education, at all levels from literacy through scientific and technological education. Such improvement requires interventions at all levels of education. First, the concentrated efforts of the past ten years to ensure girls' and women's access to quality basic education should be continued and strengthened. Information technologies could be integrated into girls' education and women's literacy programs to expose girls to new technologies at early stages and allow for much needed integration of these two program areas.

Beyond access to basic education, girls and women must be equipped with skills to prepare them for a range of roles in information technology as users, creators, designers, and managers. Therefore, efforts should focus on increasing the number of girls and women studying IT-related subjects in

formal schooling and seeking IT training outside of school, as well as related areas to help them fully utilize IT skills.

Generating Demand for IT Education

Educators and researchers in both developed and developing countries have focused their attention on strategies to raise girls' demand for IT education. They recommend educating families and teachers on the importance of encouraging girls in science and math, building girls' confidence and self-esteem to have more confidence to study nontraditional subjects, such as math or computer science, and exposing girls to computers and the Internet at early stages "before gender stereotypes begin to influence girls' attitudes."[290] U.S.-based research, such as the American Association of University Women's (AAUW) study *Tech-Savvy: Educating Girls in the New Computer Age* shows that boys often gain exposure to computers at earlier ages and tend to dominate computers in group activities so that girls do not have equal access. The study recommends ample use of hands-on, practical components to S&T curricula in order to engage girls and build their confidence with often unfamiliar hardware and software.[291] The AAUW's research also suggests a need for greater awareness among girls and women of how S&T skills apply to a wide range of careers, beyond the stereotypical "techie" jobs.

Changes in the way science and technology are taught may also help attract more women to these fields. For example, a 1999 Carnegie Mellon University study showed that female students were more interested than were male students in the "social context" of computing. CMU conducted the study in response to low enrollment and retention of women in the university's computer science department. CMU's research found that nearly half of the young women vs. only about ten percent of the men students linked their interest in computers to other areas, such as medicine, education, space exploration, and the arts. Young women cited the importance of "doing something" with their skills "to connect computer science to real-world problems." As a result of their research, CMU integrated nonscience disciplines into their computer science program and offered a computer science course in which students work with community nonprofit organizations to apply their skills to community issues. Subsequently the number of female students enrolled in the computer science program at Carnegie Mellon has increased dramatically.[292]

Cathy-Mae Karelse from South Africa also advocates adapting IT training to make it more appealing to girls. She suggests that girls are more attracted to technology education if the curriculum "relates projects to the real world, beyond the school and domestic contexts, and places problems in context to avoid abstraction."[293] Asked what they would like to be doing in ten years time, female students in a postgraduate IT training program in South Africa expressed a desire to apply their skills to real-world problems:

> There will be people who don't know anything about computers, and I would like to start a small business to help them.
>
> I want to see the young kids get into IT and develop the place where I came from. [294]

Some initiatives in developing regions use innovative strategies to engage girls in science and technology careers. A UNIFEM-supported research project in Brazil brought women scientists and engineers as role models to girls in secondary schools. FAWE is developing toys for girls that "demonstrate scientific, technological and mathematical principles" and has created a comic book for girls with cartoons of girls and women discussing the importance of studying science and math.[295]

Making IT Education and Training Available to Girls and Women

As girls in developing countries are less likely to continue in school beyond upper primary levels, computer education should be integrated into schooling as early as possible in order to have the greatest chance of reaching girls. Programs such as WorLD and SchoolNET, among others, are providing computers mainly in secondary schools but also in some primary schools abroad.[296] Many U.S.-based IT corporations have recently begun programs providing computers and training to schools in developing countries.[297] In developing computer training, educators need to structure the free time available to students for using computers and the Internet in consideration of girls' acute time constraints due to household chores to ensure equitable exposure to computers and the Internet.

Within higher education, the possibility of scholarships helps encourage women to apply to IT-related academic programs or training. In May 2001, through a grant from the Carnegie Corporation of New York, Makerere University of Uganda announced a $1 million fund for girls from disadvantaged areas to study science. Some governments support special measures to increase women's enrollment. For instance, female enrollment in a government-supported IT training program increased after the Government of South Africa introduced such a policy. India's State of Andhra Pradesh reserves 33 percent of higher education seats for female students, which educators view as an important step in increasing women's access to the education needed for more lucrative IT careers. These policies might be directed particularly at attracting more female students in scientific and technological areas.

While degrees in science and technology are the entry tickets to the higher ends of using and producing information technology, women can master many aspects of computer use and maintenance with much less training, and with much of it available outside the formal education system. Such training is offered through commercial training centers or through community projects, such as telecenters, at no or low cost. Women with basic literacy

and possibly some formal education in a major international language meet the minimum qualifications for basic Internet and word processing training. For mid-level computer training courses, such as computer network design and maintenance and basic programming, secondary school education is necessary.

Offering IT training in institutions accessible to women will also contribute to higher female enrollments. As discussed earlier, the cost of IT training courses and high tuition at private universities offering engineering and computer science degrees are often prohibitively high for women. IT training programs offered in two-year vocational colleges and public universities are more attractive to women because they are generally less expensive and easier to enter.

Women outside the formal schooling system and already in the workforce need access to technology training to retrain and upgrade skills as well as to acquire new ones. Where it is financially feasible, public access centers could offer Internet and computer training to community members, perhaps with support from governments or in collaboration with secondary schools or universities. As Geraldine Reardon notes, continuing education through the workplace requires a commitment from employers and governments:

> Training and education cannot be carried out in isolation of the other demands made on their [women's] time. Research in Vietnam found that "in order to create favorable conditions for women to raise their level, it is necessary to work out policies and regimes that give priority to training and organizing of classes and child care centers suitable to the situation of women as well as to develop a suitable literacy program which both ensures basic knowledge and is closely linked with the practical production."[298]

Many IT training programs for women in developing countries have been developed that provide basic Internet and office suite computer training either for women's NGOs to use for political advocacy activities or for employment. However, many of these are small-scale, one-time courses that may benefit women within small communities but are insufficient to significantly boost the number of women skilled in IT. Integrating gender concerns into the recruitment and marketing activities of existing, large-scale IT training programs could go further in equipping large numbers of women with the needed technical IT skills. The Cisco Systems Networking Academy Program is an example of an IT training program with a commitment to reaching women that could train large numbers of women in developing countries. The Cisco Networking Academy Program is a training program for network technicians in the U.S. and around the world offered through secondary schools, vocational institutes, universities, and nonprofit organizations. To increase female enrollment Cisco uses female role models in advertisements and promotional materials. It is creating a web site devoted to sharing strategies for increasing female participation in IT training and supporting pilot programs to reach

marginalized women in developing countries. The Cisco curriculum also includes a gender equity training module. With the support of the World Bank *info*Dev, Cisco and the United Nations Economic Commission for Africa are establishing an African regional training program in Internet networking technology for African women at the Information Technology Center for Africa at ECA headquarters in Addis Ababa.[299]

Ensuring that Women Get the Right Skills

Once the demand for and access to IT education are in place, women need a range of skills and aptitudes with which they can pursue the opportunities made available through IT. In its *Employment Survey 2001*, the ILO identifies two types of skills needed for IT in enterprises:

> The first relates to a variety of foundation skills, such as the ability to learn, to communicate, and to analyse and solve problems, all of which are essential to work environments that rely on rapid innovation, and the interpersonal exchange and creation of knowledge. Beyond such skills, however, are the technical skills related to IT itself, the need for which extends well beyond the IT sector to the economy as a whole.[300]

Beyond the technical skills for developing, using, or maintaining IT software and hardware, women, as well as men, need other skills "to fully participate in the information society and to shape society to improve their quality of life." Karelse argues that women need information literacy—skills both in disseminating the knowledge that they produce and in using their knowledge to influence decisionmaking. In addition, Karelse argues that "those who design, build and maintain the technological infrastructure need to know something about the social effects of the use of those technologies—that is, what kinds of content are carried and what happens when content of different types flows." She defines information literacy as "the ability of learners to access, use, and evaluate information from difference sources, in order to enhance learning, solve problems, and generate new knowledge."[301] Women and men in developing countries may be particularly ill-equipped with these skills, because formal schooling in developing regions still retains the values of colonial education systems, emphasizing memorization rather than critical thinking or reflection.

Similarly, Heeks maintains that the information of most value to poor people is "locally-contextualized," "relevant" information. Heeks argues that what may benefit poor women and men the most is "interaction" and exchange of information "between communities and community members, rather than ... the transfer of data from North to South." As an example of what is needed, he describes a successful project organized by the township of Alexandria in South Africa that worked with school children to develop an online database of local resources, including information on township organizations and their capacities. Community groups used the database to identify business partners from larger firms in Johannesburg.[302]

Most nonformal Internet training programs focus on providing technical skills for how to access and navigate the Internet but do not teach how to sort through the wealth of information on the web to use it to address students' own priorities and problems. For Kareise, the goal is for women to become not only technically competent but also informed about how they can use their experience—their information and knowledge—to improve their position in society."[303] Internet training curricula could be developed that include case studies of other local organizations or villages documenting how they used the Internet or IT for development projects. Training manuals could include exercises involving an online exchange between trainees and villages or community-based organizations (CBOs) to share lessons learned or successful strategies used. Trainees could develop their own content and use it for projects, such as political advocacy, income generation, or disseminating information to their community. The Society for International Development and UNESCO's "Women in the Digital Age" training handbook is a good example of an IT curriculum that includes case studies of other CBOs that have successfully used the Internet.[304]

A Moroccan teacher receives computer-assisted training at a teacher training college in Taroudant

Women also need entrepreneurship and business management skills to apply IT skills. This is a particular need in South Africa, where *Apartheid* sapped South Africans of the incentives and educational foundation essential for entrepreneurship.[305] Women, in particular, lack knowledge of where and how to find capital to support their business ventures. IT training programs for women could include training on how to develop business plans, conduct market surveys, and provide information on sources of funding and venture capital firms in emerging markets. The ECA-Cisco Internet networking training program includes entrepreneurship and management in its curriculum. While training women from across Africa as network technicians, it also aims to equip them with an understanding of gender and development, entrepreneurship, and management.[306]

MICROCREDIT

In addition to access and education, capital is an essential input in ensuring women's ability to take advantage of the opportunities presented by information technology.

The prior section on "Opportunities for Women's Economic Empowerment" (pp.49-64) discussed economic opportunities that information technology can offer to women in developing countries, including those for women entrepreneurs in the application of IT tools to existing businesses as well as for the establishment of new IT-enabled businesses. The profiles and prerequisites of the new business opportunities resemble those of existing women-owned businesses in developing countries (focus on trade, services, and light manufacturing; five employees or fewer, often from their families; owners with low levels of education and literacy; women entrepreneurs starting up with less professional work experience and knowledge of their sector than male counterparts; market sectors with low barriers to entry; and often home-based).[307] The only characteristic that differentiates them from existing businesses is the use of new technologies, since most women-owned businesses in developing countries use traditional technologies. As most developing country women entrepreneurs are poor, operating in the informal sector and lacking in capital as well as documentable assets, they need capital from nontraditional finance institutions to start up IT-enabled businesses or use IT tools to enhance existing businesses.

Microfinance schemes, which have targeted women because of their high rate of repayment and because lending to them reaps social dividends, are the most likely source of the necessary financial inputs.[308] The best known model is that of the Grameen Bank and Grameen Phone operation, which combines lending to women's IT-enabled microenterprises with social and economic assistance and training in entrepreneurial skills.[309] Globally there are more than a thousand such microfinance networks, many of them targeting women and providing economic and social supports. From headquarters in Paris, EthicVillage.com makes microloans to women's handicrafts cooperatives in developing countries and then markets their products on the Web.[310] It would be misleading, however, to think that microloans are available to any woman who needs one. Current microloan funds can reach only some five percent of potential borrowers worldwide. Suggestions have been made that the use of small handheld dataentry devices and of smart cards could cut transaction as well as interest costs (typically 48-60 percent annually) and greatly expand the number of women reached.[311] Other projects, including one starting up in Ghana, are underway to provide electronic banking services to the informal sector in which most women entrepreneurs operate.[312]

One task is to make microfinance project managers aware of the viability of women's IT-enabled businesses. A second task is to make them aware of the importance of using IT tools to strengthen existing businesses so that they would not hesitate to make loans to such enterprises. Given the record of

microfinance in reaching poor women and helping them rise above poverty, the support by microfinance project managers of lending related to women's enterprises utilizing information technology could be an important aspect of women's economic empowerment in developing countries.

HOW POOR WOMEN CAN ACCESS AND BENEFIT FROM IT

> "Poor people need good health, not computers," said Bill Gates, Chairman and Chief Software Architect, Microsoft Corporation and world's richest man.[313]
>
> "Poor women face a double disadvantage in access to resources and voice—they are poor and they are women."[314]

Do poor people in developing countries need information technology? While Bill Gates and others believe that providing basic needs must come first, many others feel that IT can help meet basic needs and can provide access to resources to exit from poverty. In considering whether information technology can help poor women, the relevant questions are **how** (are there ways to overcome the constraints that prevent most poor women in developing countries from using these technologies now?) and *for* **what** (are there ways in which information technology—of all kinds—can be the most cost effective means of helping poor women in developing countries meet their basic needs and exercise their fundamental rights?). The starting point should not be technology, but rather the real needs of poor women, especially for appropriate information—for access to government and its records, in pursuit of economic activities, and to gain information on health and education.

Technological Constraints

Technological and social solutions must overcome the constraints that presently keep poor women from using information technology. While most of these solutions have been tested in pilot projects, few have easily replicable business models. Several of these solutions are described below.

No Telephones, No Electricity

A project has started in Andhra Pradesh, India, using packet switching to route Internet data and telephone calls through the spare capacity of railroad cables to areas presently without telephone service. If successful, it would provide connectivity at rates below those of any other option.[315]

For areas where there is no electricity, the Pondicherry project in India combines power supply from the grid with battery backup and solar power. India's one billion oxen drawing water have been suggested as a potential source of 40,000 megawatts of power a year.[316]

Wireless and Satellite Connectivity

Pilot projects have been put in place in Mongolia as well as in Chennai (Madras), India, and elsewhere using wireless radio modems for transmission of Internet data to remote, sparsely populated areas where there are no landline telephones.[317] Radio links and satellite broadcast technology provide connectivity to a telecenter in the KwaZulu Natal province of South Africa where telecommunications infrastructure (both landlines and cellular coverage) are very limited. Wireless telephony could not be used because the Telkom telecommunications company has a monopoly until 2003 on fixed telephone service. This is a low-cost solution, estimated at $3000 per rural communal site, including computers, with recurring monthly costs of $40.[318] It contrasts strikingly to some high-cost connectivity solutions that run as much as $100,000 per connected site.[319]

Inexpensive Multiple-User Computers

Rapid progress is being made towards the availability of inexpensive Internet access devices that could be installed for public access. The Simputer, being developed expressly for the rural poor by Ashok Jhunjhumwala and Vijay Chandru at the Indian Institute of Science, has attracted a great deal of interest and support. With a market cost of about $200, the battery-run pocket computer/Internet access device uses free software and features a smart card that could provide a whole village with separate personal accounts on one machine.[320] The developers feel that the availability of the device will spur content development in local languages.

Interlinking Technologies

Information technology does not have to be computers and Internet. Radio, television, embedded chips, and links between old and new technologies are important IT tools in reaching poor people in developing countries. In South Africa, the women-run Moutse Community Radio Station, founded by members of the Rural Women's Movement (RWM), a national organization that lobbies around issues of concern to poor rural women, is a major tool for poor women's empowerment in Mpumalanga province.[321] The Kothmale FM radio station in Sri Lanka combines traditional community radio serving a poor and isolated rural area of Sri Lanka with Internet and computer technology. The radio station provides an interface between the Internet and the rural community. On the program "Radio Browse the Internet" listeners send in queries, a search is done for them, and the results are broadcast in the local language. The station set up two free community Internet access points that the community also uses to produce radio programs. Kothmale has also developed a database, available at the access centers, of frequently requested information of local interest downloaded from the Internet.[322]

Social and Economic Constraints

Literacy

Interfaces have been developed using icons, graphics, touch screens, and voice recognition for the illiterate and neo-literate.

Language

Translation software, even to/from relatively obscure languages, is becoming easily available. However, more than translated material, original local language content will go a long way to making IT relevant to local communities everywhere. This approach is being used heavily in India.[323] The involvement of young people from the digital diaspora working to encourage IT development in their home countries and home villages would stimulate both software and content development in local languages. The International Development Research Centre and the International Women's Tribune Center have produced a CD-ROM for women in Uganda that bridges both literacy and language barriers. Produced in Luganda voice, the CD-ROM entitled "Rural Women in Africa: Ideas for Earning Money" presents suggestions for women's microenterprises that illiterate women can understand easily.[324]

Access costs

Public access centers should be able to provide services at rates affordable to the rural poor. Studies have shown that poor rural communities are willing to spend money on communication if it is available.

Ways in Which IT Can Benefit Poor Women

There are many pilot projects underway that show information technology reaching and benefiting poor people in developing countries, with women among the beneficiaries. Some are exclusively for women; others are not. Nevertheless, they are all examples of projects that could be replicated to address the needs of poor women in developing countries. Some of the most interesting and innovative are described below.

E-governance

Poor women can profit greatly from having access to government information online, such as land registration through the Computer-aided Administration of Registration Department (CARD), functioning in Andhra Pradesh in India since 1998.[325]

E-commerce shared-interest business networks

The most successful cases of the poor benefiting from information technology are those based on advancing common economic interests through access to

information not easily available previously. These cases also underline the point that information in and of itself has no value unless it is relevant to the local context. The projects described below fall under the general rubric of e-commerce, but they are locally based and differ from the externally oriented projects that use the Web to market women's handicrafts to affluent consumers in developed countries.

SEWA

The Self Employed Women's Association (SEWA) has been organizing women in the informal sector in India since 1972. It was one of the first organizations globally to realize the potential of using IT for the productive growth of the informal sector. SEWA is establishing Technology Information Centres in eleven districts of Gujarat to provide computer awareness training and basic computer skills for their "barefoot managers," build the capacity of women organizers and leaders, and strengthen their members' microenterprises. Electronic networking is expected to strengthen the connections between the various cooperatives working in different sectors and areas. In the second phase, the centers will also support the education of girls.[326]

Gyandoot/Dhar

Organized by the district government of Madhya Pradesh (India), Gyandoot is an Intranet linked to the Internet that connects some 26 rural information centers in Dhar district and serves half a million people. Daily price and volume information is provided from major national agricultural produce markets. Users can get printouts of land records that they need to get crop loans from banks. They can file applications online for government benefits and services and post grievances, with replies guaranteed in a week. Users can send e-mail in Hindi to each other or to connected village level institutions and district offices. Unemployed high school graduates whose income derives from sale of services to villagers operate computers.[327]

Coffee Planter Kiosks

In India, Bangalore ITC plans to set up 25 Internet kiosks in Karnataka for coffee planters to get global price information and sell their produce at the right time. A local portal is being developed that gathers many sources of coffee growing and marketing information.[328]

TARAhaat

Also in India, TARAhaat has been designed as a portal cum economic system to connect villagers with information services, government agencies, and markets in their local language. Local businesses will be franchised to set up cyberkiosks (TARAdhabas) for public access. Cooperative purchasing and delivery services are also part of the project.[329]

Dairy Farmers and IT

The Indian National Dairy Development Board (NDDB) has set up farmers' information and services kiosks to deliver useful content and services to poor rural people. Using information technology, the milk cooperative has seen a substantial increase in milk production, resulting in more efficient milk collection and higher profits for producers. Rural Internet kiosks have provided extensive education for farmers and dairy workers that has contributed to increased productivity. Computers are being used at 2,500 rural locations, covering a half million people, to buy milk from producers quickly and transparently. There is a digitized system for weighing and testing milk and automation of milk collection and payment procedures. When they feel that they are getting a fair price for their milk, producers produce more. Farmers can order goods and services from cooperative sector agencies and get information on a variety of subjects of local interest through the system. Available to all users, the system database includes a complete history of all the cattle that the coop members own.[330]

Health and Education Information

There is a plethora of IT projects concerned with education and health in developing countries. The Warana Project is notable because it uses computer information kiosks and training centers to bring health and education information directly to the rural poor, focusing on women, in an area that covers 70 villages in Maharashtra, India. Agricultural, medical, and other educational information is provided through cooperative societies.[331] To supplant the limited information available to women from informal sources, the Village Information Project of the Swaminathan Research Foundation in Pondicherry, South India, provides highly practical locally relevant information in local languages on health and education, as well as on prices and markets through networked Village Knowledge Centres.[332] The Marie Stopes Foundation in India uses the Internet to disseminate information on women's reproductive health.[333] California-based WomenConnect! uses IT to strengthen the capacities of women's NGOs in seven African countries to improve women's health.[334]

Most of the examples cited in this section come from India, which has become a laboratory for IT solutions that reach and benefit the poor. In addition to having a huge population of poor people, India has favorable political conditions, a high concentration of digital talent, many close ties with international corporations, supportive foundations, active nongovernmental organizations, and the active involvement of India's highly successful digital diaspora working to spur the development of information technology in their homeland. India also has a National Working Group on "Taking IT to the Masses."

Poor women in developing countries **could** improve their lives and the lives of their families with the help of information technology. Both the technological

solutions and the successful pilot projects, along with tested finance mechanisms, are already in place. However, neither the technological solutions nor the pilot projects yet have sustainable business models that would allow them to be replicated in other regions. The focus needs to turn from small projects to national programs, supported by national policy commitments. When these national programs are put into place, women must ensure that they are part of them, and that governments remember that when they talk about reaching the poor in their countries with information technology, women are the majority of those whom they are talking about.

FANTSUAM Foundation

The authors include the full text of a letter they received from the Director of the Fantsuam Foundation in Nigeria because it illustrates many of the topics discussed in the paper: IT as a tool for poverty alleviation, problems of women's access to the technology, the importance of relevant content, the role of IT in meeting basic needs, the need for public access facilities, the insufficiencies of information infrastructure in many developing countries, the need for microcredit to increase women's access to IT, the training of young girls as information intermediaries for older generations, and the possibilities of the involvement of the diaspora in bringing IT to their home countries.

National Office: Hasken-KU, MaiAdiko-Rayfield, PO Box 8452 Anglo-Jos, Nigeria. E-mail: **Fantsuamfoundation@fantsuam.com**

27 April 2001

As a women's organisation, ensuring that our members are fully engaged in our IT project is a priority and we are always on the search for new ways to make this happen. The reason for this includes the fact that IT is part of our tool for achieving our poverty alleviation target. Since we prefer to work with women as agents of this poverty alleviation scheme, it follows that any strategy has to be built around them. The problems we have faced are technophobia, accessibility, cost, and the content of information provided through the facilities.

The issue of content was quickly resolved by the women as they said they wanted the facility to provide information on availability of vaccines for meningitis, measles and visiting medical personnel at the nearest secondary level hospital, disease outbreaks and preventive measures, agricultural information on pests surveillance, how to minimise postharvest losses, availability and cost of fertilisers, weekly prices of farm produce, information on cultural activities, information on road conditions during the rainy season, information on trains and buses timetable, announcements of important dates for national examinations for rural-based secondary and tertiary students, and locale-specific meteorological information.

In order to use IT to achieve this end, we decided that a Community Learning Centre (CLC) which will provide IT training and a one-stop- shop for information was an answer. We now have one CLC at Bayanloco and a long list of requests from communities asking for assistance to set up their own CLC. A CLC comprises two rooms provided by the community. One room serves as a library and the other as the information shop and IT training class.

I started the IT class with 10 students. Five of them are women. IT instructions for three of the women require translation from English to Jju, the native language, and I am also flexible with them regarding the time they can attend the classes. Often they come straight from the market where they have been selling their farm produce, stop over at the class for one hour for their lessons and continue their journey home. We have three computers and one laptop, and electricity is not reliable. On occasion there has been no electricity to run the computers and sometimes the laptop battery has packed up and we had no funds for a replacement. It is from among these women that we will train two of them to run the information shop to provide the sort of information requested by the communities.

We are in the last phase of developing a database that our rural community health workers (most of whom are women) can use to keep their patients' records. This will be the first time these communities have a permanent record of vital statistics of birth, death, marriage etc. The health workers will receive relevant IT training to make entries into the database. We have a workshop planned for October to begin this training.

Our charges for the IT training is 30% of what commercial IT trainers charge but due to less available disposable income in the rural communities where we serve, even these fees pose a huge challenge. We have attempted to incorporate the fees into the microcredit scheme for those who wish to pay that way. We also have an 'Adopt a CLC' strategy whereby Nigerian professionals in the diaspora can provide funds for the establishment of a CLC in their home villages. The limitation of this approach is that communities that have no sons and daughters in the diaspora are left out of such assistance.

Our 24 year old van carries our laptop on market days to remote communities, but we soon found that the last thing the women wanted to do on a market day was to attend IT training. But secondary school girls were keen to learn to use the computers. As a result we are now targeting young girls for IT training. But our van is not often in a shape to undertake the journeys on the rough roads.

We have established contacts with the local Health Training Institution to have them include IT training in the curriculum for their students. Although they are keen to do so, our facilities are stretched at the moment to train the staff so that they can train their students. We believe that starting from this end will reduce the technophobia we see amongst the rural health workers.

Working in rural communities is not attractive to the private sector, and we have not been able to get other NGOs interested in providing this service either. So at the moment we are lone operators in what we see as an immense area of need. The problems of content, access, cost, technophobia can be mitigated if we had the necessary personnel, IT equipment, power supply, and reliable vehicle and if there were more organisations willing to provide these IT services.

Kazanka Comfort, Director

CONCLUSION

The Digital Divide is presently at the center of international development concerns. Following the Okinawa Summit in July 2000, the Group of Eight nations set up a Digital Opportunities Taskforce to work on ways of eliminating the divide. Given the high profile of this issue, the time is ripe to act to ensure that women in developing countries can enter the information age. Although women in developing countries have had little contact yet with the new technologies, it is clear that these technologies offer substantial possibilities to improve the lives of women and their families. There are opportunities in employment, particularly in the area of IT-enabled services and in entrepreneurship, both in applying IT to existing businesses and in starting new businesses based on technology services. With regard to political empowerment, information and communication technology is perhaps the most important tool that women have gained since enfranchisement. Information technology brings women increased access to resources. Gaining a voice and ending isolation have enormous implications for women: the lack of voice is a large measure of what has kept them from equity and parity worldwide. Information technology can mean opportunities for a whole range of women, including poor women.

Much must be done for women to reap the gains that can come from the new tools. Women need to involve themselves in national information and communications policy development with the emphasis on universal access and low cost extension of services to rural and underserved peri-urban areas to ensure that communications infrastructure reaches as many women as possible. They will need to work for an enabling environment that includes liberalized regulatory regimes to foster the growth of IT-enabled businesses.

Through the Leland Initiative in Mali, women acquire computer skills

While IT policy must be gendered, gender policy, too, must be aware of the opportunities and challenges that IT brings. These two policy and gender groups need to be aware of each other and work together. Women have a great deal to contribute to knowledge for development, and information technology can bring much to accelerate the development of women.

Along with policy, education and skills are the *sine qua non* to women's participation in the information age. They are key to women getting jobs,

retaining jobs, finding better jobs, as well as simply using the technology. Girls and women in developing countries have to continue to make educational gains. The technology moves so fast that even when girls and women have the entry level skills for jobs using IT, they must continue to upgrade those skills and gain new ones to retain their jobs. To use the technology at all, they need literacy and basic education. In order to work at the higher levels of information technology, women and girls will need good basic scientific and mathematical education and training.

The many opportunities offered by information technology have to be seized deliberately because the cost of not doing so is very high. The technology can certainly contribute to women's empowerment and to finding solutions to women's problems. And it will keep women in the mainstream of those seeking solutions.

ANNEX I: INFORMATION TECHNOLOGY EDUCATION AND TRAINING INDICATORS FOR WOMEN

(selected countries by region)

Country	% Females Tertiary Ed. (1996/97)	% Females in Nat. Sciences Tertiary Ed.
Asia and Near East		
Jordan	42	35.5
Bangladesh	20('90)	-
Cambodia	16	11
India	32('90)	30
Mongolia	60	53.6
Nepal	24('91)	-
Indonesia	31	23.8
Philippines	57	-
Sri Lanka	44('95)	31.4
Morocco	41('94)	28.4
West Bank/Gaza	44	31.7
Lebanon	49	37
Egypt	42	29
Yemen	13	16.7
Israel	51('90)	-
UAE	72	42.0
Oman	51	32.5
Tunisia	-	32.4
Algeria	44	36.3
Burma	64('94)	-
Laos	33	-
Afghanistan	42('90)	-
Pakistan	26('85)	-
East Africa		
Burundi	26	-
Eritrea	13	-
Ethiopia	19	12.1
Kenya	28	-
Madagascar	46	29.9
Rwanda	15	-
Somalia	10	-
Uganda	37	16.7
Tanzania	20	9.1
Malawi	25	-
Mozambique	24	20
Southern Africa		
Botswana	47	23.9
Namibia	-	35.2
South Africa	48	29.4
Zambia	-	-
Zimbabwe	29	14
West Africa		
Benin	19	12.6
Ghana	22	-
Guinea	11	6.5
Liberia	22	-
Mali	20	-
Latin America and Caribbean		
Brazil	-	34
Cuba	60	29.8
El Salvador	51	28.7
Guyana	58	-
Haiti	29('85)	-
Honduras	42('94)	25.9
Jamaica	-	50.3
Mexico	-	28.4
Nicaragua	54	34.7
Panama	-	35.9
Paraguay	51	47
Peru	-	-
Europe and Eurasia		
Albania	56	45
Armenia	-	37
Azerbaijan	44	27
Belarus	53	-
Bosnia-Herzegovina	55(FYR)	37
Bulgaria	60	46
Croatia	51	27
Cyprus	75	27.4
Czech Republic	47('95)	25
Estonia	53	26
Georgia	-	40
Hungary	42('92)	28
Ireland	52('91)	33.9
Kazakhstan	53	-
Kyrgyz Republic	-	-
Latvia	-	36.4
Lithuania	56	37.9
Macedonia	55	35.9
Moldova	54	37
Poland	54('93)	-
Romania	50	-
Russia	53('94)	-
Serbia	55(FYR)	37
Slovakia	49	33
Slovenia	57	30
Tajikistan	26	12,6
Turkey	-	28.7

Source: UNESCO, *Statistical Yearbook 1999.*

ANNEX II: GENDER AND INFORMATION TECHNOLOGY WEB RESOURCES

U.S.-BASED:

Africa South of the Sahara: The Internet & Computing
http://www.sul.stanford.edu/depts/ssrg/africa/elecnet.html
This Stanford University site contains links to over 50 sites related to Africa and IT.

American Association for University Women (AAUW)
http://www.aauw.org
The AAUW has a range of research publications on the topic of girls, computers, and science.

Carnegie Mellon University's Computer Science Department
http://www.cs.cmu.edu/~women/
Carnegie Mellon's CS Department has conducted research on the paucity of women in the school's computer-science and engineering academic programs. The department web site contains a series of research papers on this topic.

Women in the Information Age Project
http://www.ksg.harvard.edu/witia/educ.htm
A project of the Kennedy School of Government, Harvard University, this site contains research on the gender gap in technology.

Institute for Women in Technology (IWT)
http://www.iwt.org/home.html
IWT holds workshops and conferences, develops research, and does outreach to engage industry, academia, government, and communities to imagine, design, create, and deploy technologies that have positive impacts on women around the world.

INTERNATIONAL AND REGIONAL NON-GOVERNMENTAL INITIATIVES:

Acacia Initiative
http://www.idrc.ca/acacia/acacia-e.htm
Supported by the International Development Research Centre, the Acacia Initiative is an international program devoted to assisting sub-Saharan Africa to apply IT to its own development goals and needs. The Acacia Initiative has programs in Mozambique, Senegal, South Africa, and Uganda, giving particular attention to telecenters and policy.

African Information Society Initiative (AISI)
http://www.bellanet.org/partners/aisi/
A program of the United Nations Economic Commission for Africa to build Africa's information and communications infrastructure, adopted in May 1996, this site includes a survey of information policy in Africa and case studies for different African countries. It also documents African-origin Web content.

World Association of Community Broadcasters (AMARC)
http://www.amarc.org

An international NGO whose goal is to support and contribute to the development of community and participatory radio, with an emphasis on women's participation in community radio, through its Women International Network Initiative.

Arab Women Connect
http://www.arabwomenconnect.org/
An online forum for exchange of news and information on women's issues and programs, particularly for women in the Middle East and North Africa region.

Asia Pacific Gender Equality Network (APGEN)
http://www/apgen.apdip.net/
An Asian NGO supported by the UN that implements a variety of different women's advocacy and development programs, APGEN has a Science & Technology program that supports pilot programs and advocacy related to increasing women's access to S&T education and more effective application of IT to poor women.

Asian Women's Resource Exchange (AWORC)
http://www.jca.apc.org/aworc/
AWORC is an Internet-based women's information service and network in Asia. It is an initiative geared towards developing cooperative approaches and partnerships in increasing access and exploring applications of new information and communication technologies for women's empowerment.

Association for Progressive Communications (APC) Women's Networking Support Program
http://www.apc.org/english/about/apcwomen/index.htm
One of the first international non-governmental initiatives to recognize the importance of IT to women and girls, APC develops training, participatory research, policy, and advocacy in the area of gender and information technology, information facilitation, and regional program support.

Forum for African Women Educationalists (FAWE)
http://www.fawe.org
FAWE is a membership organization that brings together African women leaders and policy makers to support girls' and women's access to education, including S&T education and training.

International Development Research Center (IDRC)
http://www.idrc.ca
This Canadian institution provides support to research and programs related to IT for development throughout the world. Its site contains links to its partner institutions and articles and research documents related to gender and IT.

International Women's Tribune Center (IWTC)
http://www.iwtc.org
The Tribune Center's site serves women's activities internationally, with focus on gender and development. The site links to major non-profit women's web sites.

Synergy Gender and Development (SYNFEV)
http://www.enda.sn/synfev/synfev.htm
SYNFEV is an entity of ENDA Third World, Environment and Development of the Third World, a non-profit international organization based in Dakar, Senegal. ENDA-SYNFEV

aims at the dynamization of woman and gender components within ENDA's activities, in partnership with associations, groups, and networks active in the same fields.

Society for International Development, Women on the Net Project
http://www.sidint.org
SID's Women on the Net Project is supported by UNESCO and develops training materials, conducts training workshops, and develops publications devoted to equipping women with skills in using IT and raising awareness of the importance of IT for women's empowerment.

Women in Global Science and Technology (WIGSAT)
http://www.wigsat.org/
WIGSAT supports global networking on critical issues in science and technology for development. Activities include research and advocacy around critical gender, science, and technology issues; and information and communications technology activities with global or South-based initiatives.

Women in Uganda Network (WOUGNET)
http://www.kabissa.org/wougnet
A web portal for sharing news and information on Ugandan women's organizations and related activities.

Women's Learning Partnership (WLP)
http://www.learningpartnership.org
WLP is an international NGO that partners with women's CBOs and NGOs in North Africa and Western Asia to use IT for political participation and empowerment. WLP provides technical assistance and training to its partner organizations to create locally relevant materials (online, radio, video) for advocacy related to women's rights.

Women'sNet (South Africa)
http://womensnet.org.za/ict/ict.htm
Women'sNet is a South-African based NGO that serves as an online information portal for data and news on women's issues in Africa and around the world. Women'sNET also supports programs devoted to gender and IT in South Africa. The Women'sNet site is a good source for many links to African and regional gender and IT initiatives.

World Links for Development (WorLD) Program
http://www.world-links.org/english/index.html
The WorLD program, supported by the World Bank, provides IT access and training through schools and public-access programs in Latin America, Asia, and Africa. Documentation on the program available through the web notes high female participation.

INTERNATIONAL MULTI-LATERAL INITIATIVES:

Global Knowledge Partnership
http://www.globalknowledge.org/
The GKP is an "informal partnership of public, private and non-profit organizations committed to sharing information, experiences and resources to promote broad access to, and effective use of, knowledge and information as tools of sustainable, equitable development." The GKP organizes international conferences devoted to IT for development and hosts the Global Knowledge for Development (GKII discussion) listserv.

International Labor Organization
http://www.ilo.org
The ILO has publications related to gender and the IT workforce and employment, including the recent *World Employment Report 2001: Life at Work in the Information Economy*.

International Telecommunication Union (ITU)
http://www.itu.int/ITU-D-Gender/
The ITU has a task force on gender that has produced policy documents and studies on women's telecommunications service requirements, supports pilot programs (e.g., telecenters and telemedicine), and develops trainings on integrating gender considerations into telecommunications programs.

United Nations Development Program (UNDP)
http://www.undp.org/
UNDP supports programs worldwide devoted to connectivity and access and skill building. Some initiatives include:

Sustainable Development Networking Program (SDNP)
http://sdnhq.undp.org/it4dev/

United Nations Information Technology Service (UNITeS)
http://www.unites.org/

UNDP Africa's Internet Initiative
http://www.undp.org/rba/intrinit

United Nations Economic Commission for Africa (UNECA)
http://www.un.org/Depts/eca/index.htm
The UNECA supports programs, conferences, and research related to women and information technology in Africa.

UNESCO
http://www.unesco.org
UNESCO has a range of programs devoted to increasing girls' and women's participation in science and technology education and making information technologies more gender equitable.

UNIFEM
http://www.undp.org/unifem/ec_tech.htm
UNIFEM supports research and programs devoted to understanding and promoting ways in which information communication technologies (IT) can create new opportunities for women's empowerment.

United Nations University
http://www.intech.unu.edu/
The UN University conducts policy research on the impact of new technologies on the developing world. It has supported a range of research related to IT, globalization, and gender, much of which is available through its web site.

Women Watch
http://www.un.org/womenwatch/about/
WomenWatch is a UN project to create a core Internet space on global women's issues. It contains links to proceedings from gender and IT meetings, gender resources, and other UN agencies.

World Bank Information for Development Program (InfoDev)
http://www.infodev.org/
InfoDev is a grants program supporting innovative pilot projects using IT for development, several of which focus on women.

GLOBAL INTERNET NEWS, STATISTICS AND ARTICLES:

CyberAtlas
http://cyberatlas.internet.com/

Network World Fusion
http://www.nwfusion.com/research/women.html

Nua Demographic Surveys
http://www.nua.ie/surveys

The Standard
http://www.thestandard.com

Balancing Act News Update
southwood@boyden.demon.co.uk
Contains a newsletter covering African Internet content and infrastructure news.

Get Connected online magazine
http://www.connected.org

Knowledge Initiative
http://www.knownet.org
A forum for news and research and case studies on the successful use of IT for development, with a particular focus on initiatives in India and on the use of IT for poverty alleviation.

OnTheInternet
http://www.isoc.org/oti/

TechKnowlogia
http://www.techknowlogia.org

University of Manchester, Institute for Development Policy & Management
Development Informatics: Working Papers
http://www.man.ac.uk/idpm
This site contains reports and papers related to IT for development.

ENDNOTES

[1] The term "information technology" (IT) tends to be used interchangeably with information and communications technologies (ITs). The latter recognizes the multiple technologies involved as well as the ubiquitous convergence of communications with information technology. However, the term "information technology" has come to include the idea of many technologies as well as the communications element. In general, IT tends to be used more in the United States, while ICT is the preferred usage outside the U.S.

[2] Jeffrey Sachs, "A new map of the world," *The Economist*, 24 June 2000; Manuel Castells, "Information Technology, Globalization and Social Development," Paper prepared for United Nations Research Institute on Social Development Conference on Information Technologies and Social Development, Geneva, 22-24 June 1998. http://www.unrisd.org/infotech/conferen/castelp1.htm.

[3] Association for Progressive Communication Women's Networking Support Programme, "Information and Communication Technologies: A Women's Agenda." http://www.gn.apc.org/apcwomen/resources/policy/women-rights.html.

[4] An interesting aspect of the communication side of information technology is that it can render gender invisible. A popular saying about the social aspects of the Internet is "On the Internet nobody knows if you are a dog." However, the possibility of gender invisibility is different from the technology being gender neutral.

[5] "Women and the Green Revolution." http://www.fao.org/focus/e/women/green-e.htm. Since Ester Boserup's seminal work in 1970, development planners have been notified that women must be considered in the design phase of any development project. Ester Boserup, *Women's Role in Economic Development.* New York: St Martin's Press, 1970.

[6] Noeleen Heyzer, "UNIFEM and Information technology", July 2000. http://www.earthtimes.org/jul/technologyunifemandinformationjul11_00.htm.

[7] "The Internet and Poverty," Panos Briefing no. 28, April 1998. http://www.panos.org.uk/briefing/interpov.htm.

[8]Society for International Development and UNESCO, *Women in the Digital Age – Using Communication technology for Empowerment: A Practical Handbook, p. 14.* Rome, 1998.

[9] Shirley M. Malcom. "Knowledge, Technology and Development: A Gendered Perspective." http://www.wigsat.org/malcom.html.

[10] Marie Helene Mottin-Sylla quoted in "The Internet and poverty: real help or real hype" (Panos, 1998). Panos Briefing no. 28. http://www.oneworld.org/panos/briefing/interpov/htm.

[11] The statistics presented can be taken as indicative but not definitive. None of the marketing surveys reported their data-collection methodology, so it is extremely difficult to know if the figures across countries are comparable. Those that came from *ad hoc* research projects usually had only very small samples. It is not known whether figures were based on numbers of subscribers (the measure generally used in developed countries) or on estimated number of users. In developing countries with reliance on public-access connectivity, there may be as many of 25 users per account, as is the case in Iraq. "Over 3.5 million Arabs accessing the Net, according to Ajeeb.com survey," 25 March 2001, http://eit.ajeeb.com/ViewArticle.asp?Article_ID=27563. The availability of statistics on women and information technology may improve with the publication of Sophia Huyer and Gunnar Westholm, *Gender Indicators for Engineering, Science and Technology* (for UNESCO and UNISPAR, forthcoming 2001).

[12] The Government of Estonia has a very proactive policy encouraging Internet use.

[13] "Asia's e-commerce growth will increase", 18 May 2000, http://www.emarketed.com/press_releases/051800/easia.html.

[14]http://www.isp-planet.com; http://www.cnnic.cn/develst/e-cnnic200101.shtml; The Standard, http://www.ivp.org.Internet; http://www.emarketer.com 3 Nov. 2000; http://www.nua.ie/surveys. "Webchek: Women now dominate South African Web use", 4 April 2001; http://www.cyberatlas.Internet.com; Michel J. Menou and Nancy Hafkin, "Connectivity in Africa: use, benefits and constraints of electronic communications, Synthesis Report-part 2: overview of the project findings." http://www.bellanet.org/partners/aisi/prof/findings.htm; http://cneng.netvalue.com/news/index.htm; ITU, Telecommunications Indicators, 1998; U.S.

Bureau of the Census, World Population Profile: 1998, Table A-4, Population by Region and Country. Washington, D.C.: U.S. Government Printing Office, 1999; UNDP, *Human Development Report.* New York: United Nations Development Programme, 1999 (for gender-related development index, female literacy, and GDP per capita indices)

[15] U.S. women's Internet usage and total home Internet access data are from http://www.nielsennetratings.com/, 12 February 2001 and http://www.nua.com/surveys, 12 March 2001. U.S. population figures are from U.S. Census Bureau, Population Division, based on census data released 28 December 2000.

[16] Seven countries are shown on the attached table for which there are no data available on women users. Data are shown for these countries because they have been identified as among the 20 largest potential Internet growth areas—where governments have made commitments to telecommunications and Internet as tools of economic growth and where usage is increasing rapidly (http://www.interactiveweek.com, 29 September 1997). It will be interesting to watch women's use of the Internet in these countries.

[17] ITU, *World Employment Report 2001.*

[18] http://www.nua.ie.com/surveys, 15 February 2001.

[19] Chinyere Stella Okunna, "Small participatory media technology as an agent of social change in Nigeria: a non-existent option?", *Media, Culture and Society*, 17, 5 (1995); Ila Joshi, "India: towards women friendly communication technologies" in Ila Joshi, editor, *Asian Women in the Information Age: New Communication Technology, Democracy and Women.* Singapore: Asian Media Information and Communications Centre, 1998.

[20] "China set to catch up with Japan," http://www.emarketer.com, 9 February 2001.

[21] 29 March 2000, http://www.Internetnews.com/intl-news/article/0,,6_330241,00.html.

[22] http://cyberatlas.Internet.com/big_picture.

[23] International Labour Organisation, *World Employment Report 2001: Life at Work in the Information Economy.* Geneva: ILO, 2001; United Nations, *The World's Women Trends and Statistics,* p. 96. New York: 2000.

[24] Except for South Africa and the Philippines where women are 51 percent of users. Internet use in South Africa is largely a phenomenon of the white population, whose economic situation is much more that of a developed than a developing country.

[25] http://www.nua.ie/surveys, 21 January 2000 and "Webchek: Women now dominate South African Web use," 4 April 2001; January 2001 http://www.cnnic.cn/develst/e-cnnic200101.shtml.

[26] International Telecommunication Union, *Internet Indicators, 2000.* Geneva: 2000; List of Least Developed Countries (as of 27 March 2000) http://www.unctad.org/en/subsites/ldcs/document/ldc-list.htm.

[27] ITU, *Telecommunication Indicators 2000.*

[28] http://www.netsmartamerica.com/NetSmartIII.htm NetSmart, a market-research company focusing on the Internet-use habits of American women, ceased operations on 12/31/00 with the death of its founder and president. However, the reports can still be found in cached versions at Google.Net.

[29] Rhona O. Bautista, "Staking Their Claim: Women, Electronic Networking and Training in Asia," p. 175, in Wendy Harcourt *Women@Internet: Creating New Cultures in Cyberspace.* London: Zed Books, 1999.

[30] Colleen Lowe Morna and Zohra Khan, "Net Gains: African Women take stock of information and communication technologies." (June, 2000), p. 41. http://www2.womensnet.org.za/beijing5/news2/show.cfm?news2_id=120 or ftp://faramir.wn.apc.org/pub/womensnet/net-gains-full.rtf.

[31] Panos Briefing 28, *loc. cit.*, p. 5.

[32] Nancy J. Hafkin, "Convergence of Concepts: Gender and ITs in Africa," in Eva Rathgeber and Edith Ofwona Adera, editors, *Gender and the Information Revolution in Africa,* Ottawa: International Development Research Centre (IDRC), 2000, p. 8. Available at http://www.idrc.ca/books.

[33] Edie Farwell, Peregrine Wood, Maureen James, and Karen Banks, "Global Networking for Change: experiences from the APC Women's Programme," pp. 102-103 in Harcourt, Women@Internet.

[34] *Ibid.*, p. 103.

[35] Alice Mastrangelo Gittler, "Mapping Women's Global Communications and Networking," p. 94. in Harcourt, Women@Internet.

[36] "Women, the Information Revolution and the Beijing Conference." http://www.un.org/womenwatch/daw/public/w2concl.htm; Sally Burch, "Latin American Women Take on the Internet" http://www.connected.org/women/sally.html. The web sites of the above-mentioned organizations are, respectively, http://www.neww.org, http://www.laneta.apc.org, http://www.ecuanex.apc.org/alai/women/html, and http://www.ica.ax.apc.org/aworc.

[37] Fatma Alloo, "Information Technology and Cyberculture: the Case of Zanzibar," pp. 156-161in Harcourt, Women@Internet.

[38] Bautista, "Staking their claim," pp. 176-179 in Harcourt, Women@Internet. A listserv® is an electronic mailing list that allows people to send e-mail to one address; their message is then copied and sent to all the other subscribers to the list.

[39] "Transcending the gender information divide: Report of the Global Knowledge II Women's Forum (2000)." http://www.globalknowledge.org.my/.

[40] Reference to AED and USAID's LearnLink Project in Mary Fontaine, "A High-Tech Twist: IT Access and the Gender Divide," in *TechKnowLogia*, March/April, 2000. http://www.TechKnowLogia.org.

[41] Rosemary Brisco, "Asian Women Online-Making a Net Impact," (2000) http://www.cipe.org/pub/women/netimpact.php3; "WomenAsia.com Closes" (2000) http://www.womenasia.com/eng/community/articles/net_empowers.html.

[42] "Las Mujeres Empresarias en Mexico: Fuerza Economica Emergente [Women Entrepreneurs An Emerging Economic Force in Mexico]." (1998), http://nfwbo.org/LocLink/BIZC/RESEARCH/Linkto/10-28-1998/SumarioEjecutivo.htm.

[43] Julie R. Weeks, National Foundation for Women Business Owners [USA], "The Face of Women Entrepreneurs: What We Know Today," Second OECD Conference on Women Entrepreneurs in SMEs: Realizing the Benefits of Globalisation and the Knowledge-Based Economy," Paris, 29-30 November 2000, http://www.oecd.org/dsti/sti/industry/smes/act/Women2000/weeks.pdf,

[44] http://www.cyberatlas.Internet.com/big_picture/demographics/0,1323,5901_434551,00.htm ; Margaret Gallagher, "Lipstick imperialism and the new world order: women and media at the close of the twentieth century." Paper prepared for the Division for the Advancement of Women, Department for Policy Coordination and Sustainable Development, United Nations, http://www.un.org/documents/ecosoc/docs/cn6/1996/media/gallagh.htm .

[45] http://www.Internetnews.com/intl-news/article/0,,6_317381,00.html.

[46] http://www.Internetnews.com/ec-news/article/0,,4_319151,00.html.

[47] http://www.Internetnews.com/IAR/article/0,,12_564281,00.html. To have 40 percent of Indian women online in five years seems extraordinarily optimistic given that nearly 40 percent of Indian women are illiterate.

[48] Swasti Mitter, Keynote Address: Women in Knowledge Societies, The Global Knowledge II Women's Forum Final Report, March 2000. http://www.globalknowledge.org/my/GKII_WomenForum_FinalReport.doc.

[49] Gillian Marcelle, "Gender Justice and Information and Communication Technologies (ITs)," presented to the Expert Panel on "Emerging issues, trends and new approaches to issues affecting women or equality between men and women" at the 44th Session of the United Nations Commission on the Status of Women, 28 February-17 March 2000, New York. http://www.fire.org.cr/ITtext.htm and http://www.impactafrica.org/CWSGender_Icts.htm.

[50] These figures were compiled from lists of senior government officials from developing countries using the ITU *Global Directory*, Geneva: 2001.

[51] Membership of the groups is listed at http://www.itu.int/ITU-D-STGrps/SGP_1998-2002/SG1/ContactPoints/SG1chair.htm and http://www.itu.int/ITU-D-STGrps/SGP_1998-2002/SG2/ContactPoints/SG2chair.htm .

[52] http://www.icann.org/general/abouticann.htm. ICANN has only one woman director—Linda Wilson, from the U.S.

[53] Mitter, "Who benefits: measuring the different impact of new technologies," p. 234 in *Missing Links: Science and Technology for Sustainable and Equitable Development.* Ottawa: International Development Research Centre, 1995.

[54] Communication from Anthony Meyer, G/HCD, USAID, 26 April 2001.

[55] http://www.itu.int/ITU-D-Gender/.

[56] "Memorandum of Understanding Governing Collaboration," ITU, UNDP and UNIFEM, 6 July 2000. http://www.undp./org/gender/programmes/MOU-ITU-UNDP-UNIFEM.pdf.

[57] Most commercial pornography sites charge for access and demands credit cards for payment. However, enormous numbers of free, non-commercial sites remain.

[58] "Chicago Tribune: Prostitutes hook up to the Net," 19 January 2001. http://www.nua.ie/surveys/index.cgi?f+vs&art_id=905356362&rel=true.

[59] "The Net feeds boom in sex trade and slavery." http://www.mercurycenter.com/svtech/news/indepth/docs/brazil010301.htm, 3 January 2001.

[60] http://www.miramedinstitute.org/Trafficking.html.

[61] A number of pilot projects and experiments are underway to make computers accessible to the non-literate. However, such access is not yet easily available in developing countries.

[62] P. Fraser-Abder and J.A. Mehta, "Literacy for all," pp. 201-218 in *Missing Links.*

[63] Richard Heeks, "Information and Communication Technologies, Poverty and Development." Development Informatics Working Paper Series. No. 5. Institute for Development Policy and Management, University of Manchester, UK. 1999. http://www.man.ac.uk/idpm/diwpf5.htm.

[64] *Ibid.*

[65] "Global Networking for Change: Experiences from the Association for Progressive Communications (APC) Women's Program." http://www.community.web.net/apcwomen.

[66] http://www.vila.com, 2000. After English, the languages found most often on the Web are Japanese, German, Chinese, and French.

[67] Sophia Huyer, "Supporting Women's Use of Information Technologies for Sustainable Development." WIGSAT submitted to the Gender and Sustainable Development Unit, IDRC. February 1997. http://www.idrc.ca/acacia/outputs/womenicts.html and http://www.idrc.ca/acacia/outputs/womenicts.html.

[68] "Global Networking for Change: Experiences from the Association for Progressive Communications (APC) Women's Program." http://www.community.web.net/apcwomen.

[69] Mary Fontaine, "A High-Tech Twist: IT Access and the Gender Divide," *loc. cit.*

[70] UNIFEM and UNU/INTECH. "Gender and Telecommunications: An Agenda for Policy." 2000. http://www.unifem.undp.org/conferen.htm. In Ethiopia, 20 hours of access per month costs $77 (including local phone costs), while per-capita income is estimated at $110/year.

[71] Ellen Balka, "Women and Computer Networking in Six Countries." *The Journal of International Communication*, 3 (1). 1996.

[72] "Global Networking for Change: Experiences from the APC Women's Programme." http://community.web.net/apcwomen/part1.htm.

[73] Interviews with engineering teachers in Jordan and the United Arab Emirates.

[74] "Initial Lessons Learned About Private Sector Participation in Telecentre Development." National Telephone Cooperative Association. http://www.ntca.org.

[75] International Telecommunication Union Task Force on Gender Issues, 2000.

[76] UNU/INTECH and UNIFEM, "Gender and Telecommunications: An Agenda for Policy," *loc. cit.*

[77] The majority of respondents were from Saudi Arabia, Egypt, UAE, Jordan, Bahrain, and Kuwait.

[78] Women's Learning Partnership, "Cultural Boundaries and Cyberspaces" video. 2000.

[79] Sugrata Mitra, Sr. Vice-President of NIIT, from his presentation at the USAID Conference on "New Technologies for Development and Disaster Relief." Washington, D.C. January 2001.

[80] *Acting Locally, Connecting Globally: Stories from the Regions*, p. 84. Women in Sync, ToolKit for Electronic Networking. Vol. 2. Manila: APC Women's Networking Programme, 2000.

[81] "Women-only Internet Café closed down in Mecca." http://www.hrea.org/lists/huridocs-tech/markup/msg00472.html, April 2000.

[82] H. Shreiner, "Rural Women, Development, and Telecommunications: A Pilot Program in South Africa." *Gender and Development*, 7, 2, 1999, pp.54-70; Peter Benjamin, "Telecentre 2000: International Case Studies: Africa." http://www.sn.apc.org/community/T2000LitRev.htm.

[83] Marcelle, "Transforming Information and Communication Technologies for Gender Equality."

Gender in Development Monograph Series. # 9. New York: United Nations Development Programme: 2000; Mitter and Sheila Rowbotham, *Women Encounter Technology. Changing Patterns in Employment in the Third World*, pp. 19-43. London and New York: United Nations University Press, 1995. Also available at http://www.unu.edu/unupress/unupbooks/uu37we/uu37we00.htm; Reardon in collaboration with Mitter and Cecilia Choon Sim Ng, *Globalisation, Technological Change and Women Workers in Asia*, p. 29 UNU/INTECH: Maastricht, 1998. Also at http://www.intech.unu.edu/publicat/projout/listpo.htm. Harcourt, *Women@Internet:*UNIFEM, *Progress of the World's Women.*

[84] Marcelle, "Transforming Information and Communication Technologies for Gender Equality." *loc. cit.*

[85] "Who's Lagging Now? Gender Differences in Secondary Course Enrollments," 2, 3, February 2001. *California Counts*. Public Policy Institute of California (PPIC). http://www.ppic.org.

[86] Rathgeber, "Schooling for What? Education and Career opportunities for women in science, technology, and engineering," in *Missing Links*, pp. 181-200.

[87] D. Kozen and S. Zweben, "1996-1997 CRA Taulbee Survey: Undergrad Enrolments Keep Booming, Grad Enrolments Holding Their Own." *Computing Research News*, March 1998.

[88] Jane Margolis, Allan Fisher, and Faye Miller, "Caring About Connections: Gender and Computing." Carnegie Mellon University (1999). http://www.cs.cmu.edu/~gendergap/papers/IEEE99.html.

[89] The UNESCO Statistical Yearbook defines natural sciences as computer science, engineering, math, architecture, agriculture, forestry, craft and industrial trade, transport, and communications.

[90] AAUW Educational Foundation Commission on Technology, Gender, and Teacher Education, *Tech-Savvy: Educating Girls in the New Computer Age*, Washington, D.C., 2000; AAUW, *Growing Smart: What's Working for Girls in School*, Washington, D.C., 1995. Information about these publications is available at http://www.aauw.org/2000/techsavvy.html and http://www.aauw.org/2000/gs.html.

[91] Marion Hersh, "The Changing Position of Women in Engineering Worldwide." IEEE *Transactions of Engineering Management*. Vol. 47. No. 3. August, 2000, p. 346.

[92] Interviews with Cisco Networking Academy Program instructors, 2000, at Universidade de São Paolo, Brazil, Jordan University of Science and Technology, United Emirates University, and ITESM Estado de México, 2000.

[93] http://gstgateway.wigsat.org/TA/ed/whyeduc.html. AAUW, *Tech Savvy: Educating Girls in the New Computer Age*; NUA Internet Surveys, 18 July 2000, "AAUW: Girls Turned Off by 'Nerdy' Image of Information Technology," http://www.nua.ie/surveys/gasat/papers/ngp.htm; Rathgeber, "Schooling for What?" in *Missing Links*. Ironically, in Afghanistan before the Taliban regime more than 50 percent of students enrolled in natural sciences were women.

[94] Ng, "Teleworking and Gender in the Information Age: New Opportunities for Malaysian Women?" http://gendevtech.ait.ac.th/gasat/papers/ngp.htm.

[95]"Girls Locked out of Science Courses," from *The Nation* [Nairobi] in http://www.allAfrica.com, November 2000.

[96] Georgina Quaisie, "Paving the Way for Girls to Achieve Excellence in Science and Math; science, technology and math education (STME) clinic for girls." http://www.wigsat.org/gasat/42.txt. Papers from the eighth International Conference of the Gender and Science and Technology Association (GASAT8).

[97] Rathgeber, "Schooling for What?" in *Missing Links*, p. 188.

[98] Report of the UNESCO African Regional Forum on Women, Science and Technology. Ouagadougou, Burkina Faso, 25-28 January 1999, http://www.unesco.org/science/wcs/meetings/afr_ouagadougou_99_report.htm. The Sudan rates in both instances are nearly double those of the U.S.

[99] Mitter, "Information Technology and Working Women's Demands," in Mitter and Rowbotham, *Women Encounter Technology*, pp. 19-43.

[100] Interview with engineering professor at United Arab Emirates University, 2000.

[101] Interviews with Cisco Networking Academy Program instructors and students in Romania, South Africa, and Mexico. 2000.

[102] Joseph Manu. "Great Indian IT Jobs: $20 a Month." http://www.wired.com. November 24, 2000.

[103] *Ibid.*

[104] Ellen Spertus, "Dealing with critical mass," 1994, http://www.mills.edu/ACAD/INFO/MCS/ieee/paragraphstar3_3_11_0_2.html.

[105] Valentine Moghadam, *Women, Work, and Economic Reform in the Middle East and North Africa.* Boulder, Colorado: Lynne Rienner Publishers, Inc., 1998.

[106] *Ibid.*

[107] http://www.hindubusinessline.com

[108] UNU/INTECH and UNIFEM, "Gender and Telecommunications: An Agenda for Policy," *loc. cit.*

[109] Ng, "Making Women's Voices Heard." *loc. cit.; SAITIS Baseline Studies: A Survey of the IT Industry and Related Jobs and Skills in South Africa,* 2000, http://www.saitis.co.za/studies/jobs_skills/.

[110] Hersh, "The Changing Position of Women in Engineering Worldwide," *loc. cit.*

[111] Interview with instructors at SENAC in São Paolo, 2000.

[112] *First South African Report on CEDAW.* 1997. http://www.polity.org/za/govdocs/reports/cedaw.html.

[113] Interviews with female students and instructors in the Cisco Networking Academy Program in Romania, the Philippines, Mexico, and Russia, 2000.

[114] Moghadam, *Women, Work, and Economic Reform;* Reardon, *Globalisation.*

[115] Questionnaire responses from computer-networking faculty in Russia and United Arab Emirates.

[116] Moghadam, *Women, Work, and Economic Reform.*

[117] Reardon, *Globalisation*; Moghadam, *Women, Work, and Economic Reform.*

[118] Hersh, "The Changing Position of Women in Engineering Worldwide," *loc. cit.*

[119] Reardon, *Globalisation*, p. 14.

[120] Hersh, "The Changing Position of Women in Engineering Worldwide," *loc. cit.*

[121] Marianne H. Marchand and Anne Sisson Runyam, *Gender and Global Restructuring: sightings, sites and resistances,* pp. 3-4. London and New York: Routledge, 2000.

[122] United Nations Development Fund for Women, *Progress of the World's Women 2000*, p. 28. New York: United Nations, 2000.

[123] Mitter, *Common Fate, Common Bond: Women in the Global Economy.* London: Pluto Press, 1986; Castells, *The Rise of the Network Society, The Information Age: Economy, Society and Culture*, Vol. 1, Ch.4. Cambridge: Oxford University Press, 1996 and *The Power of Identity, The Information Age, Economy, Society and Culture*, Vol. II, Ch.4. Cambridge: Oxford University Press, 1997.

[124] Juliet Webster, "What Do We Know About Gender and Information Technology at Work," *The European Journal of Women's Studies*, 2 (1995), p. 322.

[125] *Progress of the World's Women*, pp. 29, 130.

[126] Judy Wajcman, *Feminism Confronts Technology*. Oxford: Policy Press, 1991.

[127] Mitter, "Globalization, Technological Changes and the Search for a New Paradigm for Women's Work," *Gender, Technology and Development,* special issue on New Technologies and Women's Employment in Asia, 3 (1), 1999, p. 7.

[128] Mitter in Ng and Anne Munro Kua, eds., "New Technologies and the Future of Women's Work in Asia." Workshop Report, 13-16 September 1994, Malaysia, UNU/INTECH Publications, Maastricht, the Netherlands: 1995, p. 67. The focus of the enquiry was on computer-aided technologies as the driving force behind the current phase of globalization.

[129] Castells, *Rise of the Network Society* and *The Power of Identity*, *loc. cit.*

[130] Mitter, "Who Benefits," *Missing Link*, pp. 226-227.

[131] Meera Nanda, "Post-Fordist Technology and the Changing Patterns of Women's Employment in the Third World, "*Gender, Technology and Development*, 4, 1, (2000), pp. 47-48.

[132] *Ibid.*, p. 49.

[133] Reardon, *Globalisation*, p. 4.

[134] UBINIG, *The Impact of Technological Change on Women's Work in Bangladesh*. Dhaka: Policy Research for Development Alternatives (1995), p. 2.

[135] Ng and Kua, eds., "New Technologies and the Future of Women's Work in Asia." p. 13,*op. cit.*

[136] Pooniah and Reardon, "Women's Labor in Bangladesh," *loc.cit.*, p. 98.

[137] Mitter, *Missing Link*, pp. 228-229, *loc. cit.*

[138] Reardon, *Globalisation*, p. 29.

[139] Mitter, message to electronic discussion on "Ending Women's Economic Inequality," 6 September-15 October 1999. in preparation for Beijing+5 Conference. http://sdnhq.undp.org/ww/women-economy/msg02632.html.

[140] U.S. Congress study of office automation, cited in Ruth Pearson, "Gender perspectives on health and safety in information processing," p. 279 in Mitter and Rowbotham, *Women Encounter Technology*.

[141] Mitter, "Teleporting and Toleration in India: Combining Diverse Perspectives and Visions," *Economic and Political Weekly*, 24 June 2000, p. 2247.

[142] Mitter, "Who Benefits?" in *Missing Link*, p. 234.

[143] Andrew Bibby, "Relocation of work internationally." http://www.eclipse.co.uk/pens/bibby/textpt5.html.

[144] Mitter and Pearson, *Global Information Processing: the Emergence of Software Services and Data Entry Jobs in Selected Developing Countries*. Geneva: ILO, 1992.

[145] Pearson, "Gender and New Technology in the Caribbean," in Janet Momsen, editor, *Women and Change in the Caribbean*. London: James Currey, 1993.

[146] Soma Kumari Mendis and D.L.O. Mendis, "Impact of New Technologies on Women in the Banking Sector in Sri Lanka," p. 18. Colombo: Centre for Women's Research, 1995.

[147] Carla Freeman, *High Tech and High Heels in the Global Economy: Women, Work and Pink-Collar Identities in the Caribbean*. Durham: Duke University Press, 2000.

[148] Gowrie Ponniah and Reardon, "Women's Labor in Bangladesh and Sri Lanka: the Trade Off in Technology," *Gender, Technology and Development*, 3, 1, (1999), p.95.

[149] Mitter, "Who Benefits?" in *Missing Link*, p. 229.

[150]Sujata Gothoskar, "Computerization and women's employment in India's banking sector," pp. 150-176 in Mitter and Rowbotham, *Women Encounter Technology*.

[151] In order to accommodate their clients, women call-center workers in India not only acquire American accents themselves, but are also immersing themselves in American popular culture and taking on American pseudonyms and identities. "Hi, I'm in Bangalore (but I Dare Not Tell)," *New York Times*, 21 March 2001.

[152] Mitter, message to electronic discussion on "Ending Women's Economic Inequality," 6 September-15 October 1999. in preparation for Beijing+5 Conference. http://sdnhq.undp.org/ww/women-economy/msg02632.html.

[153] Mitter, "Teleworking and Teletrade in India," *loc. cit.*; *Teleworking and Development in Malaysia, Vol. I Integrated Report*. United Nations University/Institute for New Technologies Policy Research Project in partnership with MIMOS Bhd. and UNDP, April 1999.

[154] Fatima Janine Gaio, "Women in software programming: the experience of Brazil," pp. 205-232 in Mitter and Rowbotham, *Women Encounter Technology*, and Ng, "Making Women's Voices Heard: Technological Change and Women's Employment in Malaysia" in *Gender, Technology and Development*, (3) 1. 1999, p. 24.

[155] Mitter, "Teleworking and Teletrade," *loc. cit.*, p. 2247.

[156] Ng, "Teleworking and Gender in the Information Age," *loc. cit.*, p. 6.

[157] Reardon, *Globalisation*, p. 18.

[158] Gui Haiyan and Zhou Meihe, "Gender, Technology Change and Globalization: The Case of China," in *Gender, Technology and Development*, (3) 1 (1999), pp. 65-77.

[159] Whereas the state had been doing so in former communist and socialist countries, in most developing countries, especially LDCs, the state had never provided much, if any, social assistance.

[160] ILO, *World Employment Report 2001*.

[161] In Africa women comprise 70 percent of the agricultural workforce, and produce 80 percent of the region's food. K. Gellen, "Unleashing the power of women farmers," *African Farmer*, 11 (1994), pp. 2-6, 42.

[162] Hilda Munyua, "Application of ITs in Africa's Agricultural Sector: a Gender Perspective," pp. 86-87, in Rathgeber and Adera, *Gender and the Information Revolution in Africa*.

[163] *Ibid.*, pp. 93-94, 105.

[164] *Ibid.*, p. 99.

[165] Sarita Ranchod, "Information and Communication Technologies for Women's Equality: Access and Empowerment Issues—An NGO Perspective." Delivered to Global Knowledge II Women's Forum, Kuala Lumpur, Malaysia, March 2000. http://www.globalknowledge.org.my/GKII_WomenForum_FinalReport.doc.

[166] http://www.worldspace.com.

[167] http://www.worldspace.com/aboutus/ws_foundation.htm.

[168] Aida Opoku-Mensah, "ITs as tools of democratization: African Women Speak Out," p. 192, in Rathgeber and Adera, *Gender and the Information Revolution in Africa*.

[169] http://www.iicd.org/projects/docs/60.002.

[170] *Ibid.*, p. 196.

[171] Colleen Lowe Morna and Zohra Khan, compilers. "Net Gains: African Women Take Stock of Information Technologies." Association for Progressive Communications -Africa-Women and FEMNET. (2000) pp. 15, 65. http://www2.womensnet.org.za/beijing5/news2/show.cfm?news2_id=120-67.

[172] "Characteristics of Women Entrepreneurs Worldwide are Revealed," 5 March 1999, http://www.nfwbo.org.

[173] Margaret Snyder, *Women in African Economies: From Burning Sun to Boardroom*. Kampala: Fountain Publishers, 2000. Snyder documents the important contribution of women entrepreneurs to Uganda's economic recovery.

[174] Heeks, "Information and Communication Technologies, Poverty and Development," *loc. cit.*, p. 3.

[175] Julie R. Weeks, "The Face of Women Entrepreneurs: What We Know Today," p. 7. Paper presented to Second OECD Conference on Women Entrepreneurs in SMEs: Realizing the Benefits of Globalisation and the Knowledge-Based Economy. http://www.oecd.org/dsti/sti/industry/smes/act/women2000/weeks.pdf. In Mexico two-thirds of women small-scale entrepreneurs were using computers, and 44 percent of this group access the Internet.

[176] *Ibid.*

[177] http://www.asafe.org/Home%20page.htm ASAFE is the acronym for its French name – *l'Association pour le Soutien et l'Appui à la Femme Entrepreneur.* See also http://www.NetworkedIntelligence.com/asafe.html.

[178] "African Women and the Internet: Which Sex is the Mouse?" *Newslink Africa*, 29 Africa 2000, http://www2.womensnet.org.za/news/show.cfm?news_id=550.

[179] http://www.mujerynegocios.com.

[180] The Briefing Kit is available at http://www.networkedintelligence.com/coc.html.

[181] Heeks, "Information and Communication Technologies Uses for small businesses in developing countries." http://www.man.ac.uk/idpm/ictsme.htm

[182] The actual name of the organization is *Fédération des Operatrices de Pêche de la Grande Côte*.

[183] "A Great Leap," *Time*, 31 January 2000.

[184] Zavuga Goretti, CEEWU, quoted in "Net Gains," *loc. cit.*, p. 65.

[185] ILO, *World Employment Report 2001*, Chapter 6, "Chances for Development."

[186] http://www.ciol.com/contents/services/neoIT, 1999.

[187] Cheah Siew Hoon, "Teleworking in Malaysia: a Primer." http://www.intech.unu/edu/research/idex.htm

[188] Andrew Calabrese, "Home-based Telework and the Politics of Private Woman and Public Man," pp. 161-199 in Urs E. Gattiker, ed., *Women and Technology*. Technological Innovation and Human Resources series. Berlin and New York: Walter de Gruyter, 1994; Ng, "Teleworking," *loc.*

cit., p. 16.

[189] Ng, "Teleworking", *loc. cit.*

[190] Advait Aundhkar, Nalini Vaz, Geetha A. Pillai, D.L.N. Murthy, and S.S. Thakar, "Nature of Teleworking in Key Sectors: Case Studies of Financial, Media and Software Sectors in Mumbai," *Economic and Political Weekly* [India], 24 June 2000, p. 2286.

[191] U.S.-based web sites identify Indian sources of programming talent for U.S. companies. See, for example, http://www.ciol.com.

[192] Mitter and Asish Sen, "Can Calcutta Become Another Bangalore? Looking for Windows of Opportunity in International Telework," *Economic and Political Weekly* [India], 24 June 2000, p. 2267.

[193] Nuim Chowdury, "Putting Bangladesh's Poor Women on the World Wide Web: A Feasibility Study." p. 23. Unpublished paper produced for International Development Research Center. August 1999. E-mail contact: nuimch@interlog.com.

[194] Mitter and Sen, ""Can Calcutta Become Another Bangalore?," *loc. cit.*, p. 2267.

[195] Chowdury, "Bangladesh's Poor Women," p. 14.

[196] American Express and Aetna have contracted companies in Ghana, where 90 percent of the employees are women, to do data processing on an outsourced basis. Canadian companies are employing women in Uganda for legal transcription work. Thomas Friedman, "Protesting for Whom," *New York Times*, 24 April 2001 and "It Takes a Satellite," *New York Times*, 6 May 2001. Nora Kasiyre Mulira, "The Emerging IT Infrastructure and Applications in Uganda," Symposium on Technology in Africa, University of Illinois, 25-28 April 2001.

[197] Chowdury, "Bangladesh's Poor Women," p. 30.

[198] The example of Dorothy Okello, the Ugandan electronic engineer living in Montreal who established WOUGNET, underlines the important potential role of the "digital diaspora" in empowering women in developing countries through IT. Many young women from Africa living in Europe and North America have contacted the authors of this paper expressing their desire to work to promote IT among women in their home countries.

[199] Mitter, "IT and working women's demands" in Mitter and Rowbotham, *Women Encounter Technology*, pp. 14-16; and Mitter, "Who Benefits", *Missing Links,* pp. 235-237.

[200] Mitter, "Women in Knowledge Societies," *loc. cit.*

[201] Edwin and Maria del Carmen San Roman, "Computers and Cakes give Confidence and Cash to Peruvian Housewives." (2000). http://www.iicd.org/ base/show_story?id=4354.

[202] Simon Romero, "Weavers Go Dot-Com, and Elders Move In." *New York Times*, 28 March 2000; http://www.gol.net.gy/rweavers/; Vikas Nath, "Empowerment and Governance through Information and Communication Technologies: Women's Perspective" http://www.cddc.vt.edu/knownet/articles/womenandIT.htm .

[203] http://www.aspisland.com/opinion/chell1.asp

[204] "Networked Intelligence for Development—Integrating with information technologies in developing and emerging economies: Framework Document, 2001-2003." Unpublished document, 2001. See also http://www.networkedintelligence.com. The training will take place at the Women's Employment Centre of Kaunas to coincide with the USAID-sponsored Second Women Entrepreneurs Networking Meeting for women from transition countries and the US being held in Vilnius.

[205] Maurice Hazan, "The Virtual Souk, E-Commerce for Underprivileged Artisans." http://www.iicd.org/base/show_story?id=3903; http://www.elsouk.com.

[206] Jo Rhodes, "Can E-Commerce Build Community Assets to Empower the Trading Activities of Rural Women?", paper presented at Center for African Studies and College of Engineering, University of Illinois at Urbana-Champaign 2001 Symposium "Technology and Development in Africa," 26-28 April 2001, http://www.afrst.uiuc.edu/tech-dev/.

[207] Report of the Secretary-General. "Development and international cooperation in the twenty-first century: the role of information technology in the context of a knowledge-based economy," pp 13-14. 18 May 2000. E/2000/52. New York: United Nations, 2000.

[208] IT-enabled businesses are businesses that are made possible by ITs, particularly telecommunications and Internet connections.

[209] UNU/INTECH and UNIFEM, "Gender and Telecommunications: an agenda for policy,"*loc. cit.*

[210] Olivier Sagna, "Information and Communications Technologies and Social Development in Senegal: an Overview." United Nations Research Institute for Social Development (UNRISD). 2000. http://www.unrisd.org/infotech/project/past/htm.

[211] ILO, *World Employment 2001.*

[212] S. Ramani, "Internet Kiosks in India." http://www.intech.unu.edu/research/past-research/telewrking-India-444/equity-kiosks-summary.pdf.

[213] "Women to benefit in IT sector [in India] with corporate participation." Report of seminar on Women and the Information Economy, Bangalore, January 2000. http://www.lifestyle.zeenext.com/womansworld/articles/30-ITseminar.html.

[214] Twenty-five percent of telephone operators are men, a much larger percentage than their representation in the borrowing population as a whole (five percent). As the Grameen Bank chooses the village operators, the male management of the Bank made a gender-based decision in selecting a disproportionate number of male operators.

[215] "Grameen Telecom's Village Phone Programme: A MultiMedia Case Study." Telecommons Development Group. http://www.telecommons.com/documents.cfm?documentsid=107.

[216] ILO, *World Employment Report 2001.* The core IT sector refers to jobs in the "production" rather than the "consumption" of ITs, such as in software programming, network management, IT training, and marketing. Many aspects of IT production (e.g., software development, network management) are needed virtually everywhere IT is used. IT production does not necessarily entail hardware manufacture.

[217] ILO Press Release, "Information Technology and Development: New Key to Development?" January 2001.

[218] *Ibid.*

[219] Interviews with students and teachers in Cisco Networking Academy Program, 2000.

[220] Comments from women and men in the Cisco Networking Academy Program in Hyderabad, India, 2001.

[221] *Ibid.*

[222] *"SAITIS Baseline Studies: A Survey of the IT Industry and Related Jobs and Skills in South Africa," loc. cit.*

[223] Interviews with Cisco Networking Academy Program students and instructors at the Institute of Space/Software Applications (formerly Houwteq Institute) in South Africa, 2000.

[224] Recommended by instructors in women's polytechnics in Uttar Pradesh, India, and Cisco Networking Academy Program instructors in the United Arab Emirates.

[225] Interview with Cisco Networking Academy Program teachers at Peninsula Technikon in South Africa, 2000.

[226] Office of Women in Development, USAID, "Women's Political Participation: The Missing Half of Democracy." *Gender Matters Information Bulletin*, 3 (1999). http://www.genderreach.com/pubs/ib3.htm.

[227] Inter-Parliamentary Union, "Women in National Parliaments, as of 8 March 2001." http://www.ipu.org/wmn-e/world.htm.

[228] http://www.africapolicy.org/action/ipu.htm.

[229] The Global Knowledge Women's Forum, "Transcending the Gender Information Divide" and Najat Rochdi, "IT to Enable a Good Governance," *loc. cit.* http://www.apgen.apdip.net/resources/womens_Forum_ActionPlan.pdf.

[230] Bhavya Lal *et al.*, "Information and Communication Technologies for Improved Governance." Paper presented to United Nations Economic Commission for Africa African Development Forum 1999, Addis Ababa, Ethiopia. http://www.bellanet.og/partners/aisi/adf99docs/governance.htm.

[231] United Nations. Beijing Declaration and *Platform for Action, Fourth World Conference on Women.* 1995, A/CONF/177/20 (1995) and A/CONF/177/20/Add.1 (1995). This document can be found on the Web at: http://www1.umn.edu/humanrts/instree/beijingpla.htm.

[232] Shanyisa Anota Khasiani, "Enhancing Women's Participation in Governance: The Case of Kakamega and Makueni Districts, Kenya," pp. 218, in Rathgeber and Adera, *Gender and the Information Revolution in Africa*.

[233] Anriette Esterhuysen (1997) quoted in Aida Opoku-Mensah, "ITs as Tools of Democratization: African Women Speak Out," p. 201, in Rathgeber and Adera, *Gender and the Information*

Revolution in Africa.

[234] Khasiani, "Enhancing Women's Participation in Governance," *loc. cit.*, p. 235.

[235] Alice Mastroangelo Gittler, "Mapping Women's Global Communications and Networking," p. 91, in Harcourt, *Women@Internet*.

[236] *Ibid*., p. 95.

[237] Nuankae Wongthawatchai, "Is Cyberspace a New Communicative Space for Women?," review of Harcourt, *Women@Internet* in *Gender,Technology and Development*, 4, 2 (2000), p. 273.

[238] "Women, the Information Revolution and the Beijing Conference." http://www.un.org/womenwatch/daw/public/w2intro.htm .

[239] http://srch.un.org/womenwatch/ daw/news/dawwatch.htm and Mastroangelo Gittler, "Mapping Women's Global Communications," p. 95 in Harcourt, *Women@Internet*.

[240] Mastroangelo Gittler, "Mapping Women's Global Communications," p. 95, in Harcourt, *Women@Internet*.

[241] http://www.igc.apc.org/vsister/.

[242] Ellen S. Kole, "Whose Empowerment? NGOs between grassroots and netizens," http://www.yorku.ca/research/dkproject/crit-ict/el1.htm.

[243] http://www.awc.org.jo

[244] Lamis Alshejni, "Unveiling the Arab Women's Voice through the Net," p. 217, in Harcourt, *Women@Internet*.

[245] http://www.derechos.org/cladem/.

[246] Report of the Expert Workshop on "Global Information through Computer Networking Technology in the follow-up to the Fourth World Conference on Women," New York, 26-28 June 1996. http://srch.un.org/womenwatch/ daw/news/dawwatch.htm.

[247] Human-rights lawyer Patricia Nyambe, quoted in Opoku-Mensah, "ITs as Tools of Democratization," *loc. cit.*, pp. 207-208,

[248] Vikas Nath, "Digital Governance: Building and Sustaining Democratic and Accountable Governance Structures using ITs," p. 9. http://www.cddc.vt.edu/digitalgov/gov-menu.html.

[249] Nath, "Empowerment and Governance: women's perspective," *loc. cit.*, p. 7.

[250] Elizabeth Chipampata, MP for Kalulushi, Zambia, at Panos Internet and Telecommunications Workshop for Members of Parliament, Lusaka, 5-6 January 1998 quoted in Opoku-Mensah, "ITs as Tools of Democratization," *loc. cit.*, p. 195.

[251] Opoku-Mensah, "ITs as Tools of Democratization," *loc. cit.*, p. 196.

[252] There were two recent dramatic examples from Asia of the role of IT in making governments more transparent and accountable. In response to Internet accounts contradicting the official story, the Prime Minister of China, Zhu Rongji, in a highly unusual action for a Chinese official, publically recanted the government's previous position on the cause of a tragic school fire in rural China. In India, photos and a story on the web site http://www.tehelka.com exposed high-level bribery and brought the Government into crisis. Craig S. Smith, "Chinese Leader Backs Away From Denials in School Blast," and Celia W. Dugger, "The Sting That Has India Writhing," *New York Times*, pp. 1, 3, 16 March 2001.

[253] Nath, "Empowerment and Governance: women's perspective," *loc. cit.*, pp. 3-5.

[254] Human-rights lawyer Patricia Nyambe, quoted in Opoku-Mensah, "ITs as Tools of Democratization," *loc. cit.*, pp. 207-208,

[255] See http://docweb.pww.gov.za and Opoku-Mensah, "Need a Passport? In South Africa Head for a PIT," *Panos Features*, 4 July 1998. http://oneworld.org/panos/news/4jul98.htm.

[256] Most of the world's governments have web sites, but they tend to be externally oriented rather than directed at their own clients. Most, for example, are in English, regardless of the international language of the country, and few have any interactivity. To date most developing-country government web sites are vehicles for disseminating, rather than for soliciting information or facilitating processes. See Lal, "ITs for improved governance, *loc. cit.*, p. 20.

[257] Dr. Janice Brodman of Education Development Center (Newton MA) and Mohammed Yunus of Grameen Bank are working on a project on using IT to market women's indigenous knowledge, with the aim of generating income for women. Presentation of Janice Brodman to Radcliffe/Once and Future Network Meeting on Gender and ITs in a Global Economy, Harvard University, 1 May 2001.

[258] Opoku-Mensah, "ITs as Tools of Democratization," *loc. cit.*, p. 199.

[259] Khasiani, "Enhancing Women's Participation in Governance," *loc. cit.*, pp. 217-218, 224, 234.

[260] Opoku-Mensah, "ITs as Tools of Democratization," *loc. cit.*, p. 192.

[261] See http://www.womensnet.org.za.

[262] "Forum for Women in Democracy." http://www.win-cawa.org/uganda/organizations.htm..

[263] Kole, "Whose Empowerment?," *loc. cit.*

[264] Robin Mansell and Uta Wehn, editors, *Knowledge Societies: Information Technology for Sustainable Development*, p. 228. New York: Oxford University Press, 1998. While many developing countries have elaborated telecommunications policies, a much smaller number, mainly in Asia, have completed distinct information and communication technology policies. However, in almost all cases and in view of the convergence of information and communication technologies (which formerly used to deal with computers and telephones separately), telecommunications policies elaborated in the last decade necessarily have very strong IT components.

[265] See "Building National Information and Communications Infrastructure (NICI) for Sustainable Development in Africa," a comprehensive view of the state of IT policy elaboration in African countries produced by the African Information Society Initiative, United Nations Economic Commission for Africa. http://www.bellanet.org/partners/aisi/nici/index.htm.

[266] The Buenos Aires Declaration emerged from the first World Telecommunication Development Conference (1994) organized by the International Telecommunication Union. The Declaration can be found at http://www.itu.int/itudoc-itu-d/wtdc194/badecle.txt.

[267] In developed countries, the measure of effective telecommunications service delivery is universal service—one telephone per household. Most developed countries have telephones in 90 percent of homes. In developing countries, following the lead of the ITU World Telecommunications Development Report of 1998 and in realization of the resource restraints, the focus is on universal access. The definition of universal access, which varies from country to country, is usually based on telephone service within a certain number of minutes walk or a within certain reasonable distance or in all settlements above a certain size. Universal access usually emphasizes public- or community-access points, rather than household access. The universal-access measure is relevant to information technology in view of the convergence of information and communications technologies and with most Internet connections in developing countries still based on telephonic connections.

[268] Marcelle, "Getting Gender into African IT Policy: A Strategic View," pp. 48-49 in Rathgeber and Ofwona, *Gender and the Information Revolution in Africa.*

[269] The Conference received some thirteen documents on gender. All are accessible at http://www.itu.int/ITU-D-Gender/Background/WTDC98documents.htm . Of particular note are documents 38 and 128.

[270] In its work with African countries to implement the African Information Society Initiative, the Economic Commission for Africa emphasizes the importance of the inclusion of gender in IT policy development. The ECA has been particularly effective in Rwanda, where women and women's organizations have participated from the beginning of the policy-elaboration process.

[271] Marcelle, "Getting Gender into African IT Policy," pp. 76-83, *op. cit.*

[272] Canadian International Development Agency, "Gender equity, telecommunication development and the ITU," p. 3, document 128-E. ITUWorld Telecommunication Development Conference (WTDC-98). http://www.itu.int/ITU-D-Gender/Background/WTDC98documents.htm.

[273] Sonia Nunes Jorge, "Gender Perspectives in Telecommunications Policy: A Curriculum Proposal." Report of Working Group I. Third Meeting of the Task Force on Gender Issues, ITU, Geneva, 9-10 October 2000. Document TFGI 3/4 E. http://www7.itu.int/treg/Events/Seminars/2000/Symposium/English/document26.pdf.

[274] ITU, UNDP, and UNIFEM, "Memorandum of Understanding Governing Collaboration," *loc. cit.*

[275] Marcelle, "Getting Gender into IT Policy," p.53, *op. cit.*

[276] Communication from L. Muthoni Wanyeki, Executive Director, African Women and Development Network (FEMNET), 7 May 2001.

[277] Hafkin, "Making information and communications policies relevant to women." Report of working group 3.1, Conference on African Women and Economic Development, 28 April-1 May

1998, United Nations Economic Commission for Africa, Addis Ababa, Ethiopia.

[278] Nidhi Tandon, "Global Business, National Politics, Community Planning: Are Women Building the Linkages?" p. 138 in Harcourt, *Women@Internet.*

[279] UNU/INTECH and UNIFEM, "Gender and Telecommunications: An Agenda for Policy," *loc. cit.*

[280] African Information Society Gender Working Group, "Engendering IT Policy" http://www.impactafrica.org/AISGWG_intro.html. The AISGWG intends to revise this document in 2001; Jorge, *op. cit.*

[281] Adapted from Jorge, *op. cit.*, pp. 11-12.

[282] Pi Villaneuva, editor. *Networking for Change, The APCWNSP's First 8 Years,* p. 36, in "Women in Sync, Toolkit for Electronic Networking," Vol. II. Manila: APC Women's Networking Support Programme, 2000.

[283] "Looking at women and youth," Message by Esterhuysen to African Development Forum discussion list, 23 September 1999. http://www.bellanet.org/adf/index.cfm?fuseaction=message-list. (AISI-HITD-L Message Archives).

[284] Peter Benjamin, "Telecentre 2000 Report 2: International Case Studies, May 2000," http://www.communitysa.org.za/ and "African Experience with Telecenters," *On the Internet,* November/December 2000, http://www/isoc.org/oti/articles/1100/benjamin.html.

[285] "Monocabinas," http://www.renom.gob.pe/test/infoductos.monocabinas.shtml.

[286] NIIT presentation at the World Bank, April 2000. http://www.niit.com.

[287] SRI International Center for Technology in Learning. *World Links for Development: Accomplishments and Challenges, Monitoring and Evaluation Annual Report 1998-1999,* p. 7. The World Bank: Washington, D.C. 2000.

[288] Kazanka Comfort of the Fantsuam Foundation, Nigeria, message to the GK-D listserv, February 2001. http://www.globalknowledge.org/english/archives/mailarchives/gkd/home.html. More details on Fantsuam follow section 7.

[289] http://www.apdip.net/miu1.htm.

[290] UNIFEM, "Making a Difference in Science & Technology Case Studies," http://www.unifem.undp.org/wmdst/.

[291] AAUW, *Tech-Savvy: Educating Girls in the New Computer Age* and *Growing Smart: What's Working for Girls in School, loc. cit.*

[292] Margolis, Fisher, and Miller, "Caring about Connections: Gender and Computing," *loc. cit.* pp. 2-3.

[293] Cathy Mae-Karelse and Fatimata Seye Sylla, "Rethinking Education for the Production, Use, and Management of ITs," in Rathgeber and Ofwona, *Gender and the Information Revolution in Africa*.

[294] *Ibid.*

[295] UNIFEM, "Making a Difference in Science & Technology Case Studies," http://www.unifem.undp.org/wmdst/wmdst7.html.

[296] http://www.world-links.org/english/index.html, http://www.schoolnetafrica.org/.

[297] http://www.digitaldivide.org/who.html.

[298] Reardon "Globalization, Technological Change and Women Workers in Asia," p. 29, *loc. cit.*

[299] http://wbln0018.worldbank.org/infodev/infodev.nsf/e10cab731815133b85256983007 1f927/72defec76802f0b8852568d200742389?OpenDocument; http://www.cisco.com/warp/public/779/edu/academy/; http://www.un.org/depts/eca/tca.

[300] ILO, *World Employment Report 2001.*

[301] Karelse and Sylla, *loc. cit.*, pp. 12-13.

[302] Heeks, "Information and Communication Technologies, Poverty and Development," *loc. cit.*, pp. 7, 10.

[303] Karelse and Sylla, *loc. cit.*

[304] UNESCO and SID, "Women in the Digital Age: Using Communication Technology for Empowerment, a Practical Handbook," Rome, September 1998. The Handbook also lists useful web sites for women in developing countries. http://www.sidint.org/programmes.htm.

[305] "Digital Divide and building human capacity," message to GK-D listserv, March 12, 2001. http://www.globalknowledge.org/english/archives/mailarchives/gkd/home.html.

Peter Rojas, "South Africa," *Red Herring*, No. 93, March 6, 2001.

[306] http://wbln0018.worldbank.org/infodev/infodev.nsf/e10cab731815133b852569830071f927/72defec76802f0b8852568d200742389?OpenDocument.

[307] Veronica Gonzalez Aguilar, "Women's Participation in Microfinance." http://www.globenet.org/horizon-local/ada/9905women.html.

[308] Linda Mayoux calls the social dividends reaped from micro-finance (increased well being for women and their families and wider social and political empowerment) "virtuous spirals of economic empowerment." Linda Mayoux, "From Access to Empowerment: Gender issues in Micro-finance." October 1999. http://www.gdrc.org/icm/wind/mayoux.html.

[309] The Grameen Bank micro-credit model is now being replicated in several developing countries.

[310] http://www.ethicvillage.com. One of Ethic Village's first clients is a women's textile cooperative in Cameroon. Kenneth Neil Cukier and Benoit Faucon, "Getting e-commerce to Africa." *Red Herring*, 2 March 2001. http://redherring.com/index.asp?layout=story_generic&doc_id=RH62001806.

[311] The potential market for microloans is estimated at $75 billion per year. "Expanding Microfinance: digital technologies could automate transactions and help scale up this effective anti-poverty tool," http://digitaldividend.org/case_study_exp_temp.asp?name=33; "Digital Partners supports SEWA and SKS," http://www.digitaldivide.org/grants.html. SKS is testing the smart-card technology in micro-loans in India for replication elsewhere.

[312] The pilot project supporting banking for the informal sector in Ghana is entitled the "Autonomous System for Interactive Electronic Commerce" and is supported by the World Bank Group *info*Dev. http://www.infodev.org/exchange/exch5.htm.

[313] Bill Gates speaking at World Resources Institute Digital Dividends Conference, Seattle, October 2000. http://www.digitaldividends.org.

[314] *World Development Report 2000/2001: Attacking Poverty*, p. 118. The World Bank: Washington, D.C., 2001.

[315] http://www.cseindia.org/html/dte/dte20010215/dteanaly.htm . This is a project of Ashok Jhunjhunwala of the Indian Institute of Technology-Chennai, one of the major forces behind the Simputer (see below); http://www.tenet.res.in.

[316] N. Vittal, former secretary of the Department of Telecommunications, India, quoted in Centre for Science and Environment (CSE) *Down to Earth*, 15 February 2001. http://www.cseindia.org/html/dte/dte200110215/dte.analy.htm .

[317] http://www.panasia.org.sg/rresult/40439.htm ; http://xlweb.com/food/wireless/final.htm .

[318] Ronel Smith, "Overcoming Regulatory and Technological Challenges to Bring Internet Access to a Sparsely Populated, Remote Area: a case study." http://www.firstmonday.dk/issues/issues5_10/smith/.

[319] By contrast the LINCOS digital community centers in Costa Rica, being promoted by the MIT Media Laboratory as part of their Digital Nations initiative, cost about $100,000 per center. "Digital Community Centers: Modular digital units provide remote communities with a wide range of services." http://www.digitaldividend.org; http://www.media.mit.edu/dn.

[320] " 'Simputer' to make browsing easy for rural," *The Times of India*, 8 August 2000; http://www.simputer.org, http://www.timesofindia.com/080800/08mban12.htm.

[321] "Moutse Community Radio," pp. 247-252, in Alfonso Gumucio Dagron, *Making Waves: Stories of Participatory Communication for Social Change*. The Rockefeller Foundation: New York, 2001.

[322] "Kothmale Community Radio," in Dagron, *Making Waves*, pp. 127-132. Similar community radio connections to the Internet are found in Bolivia and are planned for Niger. UNDP, *HDR 1999*, p. 64; Lynn Gallagher and Djilali Benamrane, "Rural Access by Radio and Internet Helps Close the Digital Divide," http://www.isoc.org/oti/articles/0401/gallagher.html.

[323] http://www.cseindia.org/html/dte/dte20010215/dte_analy.htm .

[324] Presentation of Eva Rathgeber and Anne Walker to Radcliffe/Once and Future Network Meeting on Gender and ITs in a Global Economy, Harvard University, 1 May 2001.

[325] http://www.ap_it.com/card/html.

[326] ILO, "The information technology revolution: Widening or bridging gender gaps." http://www.ilo.org/puclic/english/bureau/inf/pkits/wer2001/wer01ch4.htm; http://www.digitaldivide.org/grants.html.

[327] http://www.gyandoot.net/gyandoot/intranet.html.

[328] "ITC to set up Net booths for coffee planters." http://www.cddc.vt.edu/knownet/articles/coffeebooths.html; http://www.plantersnet.com.

[329] "Internet portal TARAhaat.com will connect rural India to the global village." http://www/digitaldivident.org/case_study_exp_temp.asp?name=29; http://www.TARAhaat.com.

[330] http://www1.worldbank.org/publicsector/egov/disks.htm.

[331] "Ordinary folk on the Net: Warana, Raju, Chameli Devi," *The Times of India*, 1 January 2000. http://www.timesofindia.com/010100/01busi1.htm; "Wiring the Villages," http://www.time.com/time/.agazine/article/0,9191,88840.00.html; "Bringing IT to the masses," http://biz.yahoo.com/ifc/in/news/10301-2.html.

[332] "Village Knowledge Centres," in Dagron, *Making Waves*, pp. 319-323; http://www.mssrf.org.

[333] Mitter, *Asian Women in the Digital Economy: Policies for Participation*. UNDP: Kuala Lumpur, 2001.

[334] http://www.women-connect.org.

LearnLink is a six-year, Indefinite Quantities Contract (No. HNE-I-00-96-00018-00) of the U.S. Agency for International Development (USAID). It is funded by the Human Capacity Development Center in the USAID Global Bureau and other USAID Bureaus, offices, and missions. It is operated by the Academy for Educational Development (AED).

For additional information contact:

Dr. Dennis Foote
Project Director
(202) 884-8708
dfoote@aed.org

Steven Dorsey
Deputy Director
(202) 884-8724
sdorsey@aed.org

AED

LearnLink Project, AED
1825 Connecticut Avenue, NW
Washington, DC 20009
Fax: (202) 884-8979
Email: learnlink@aed.org
www.aed.org/learnlink

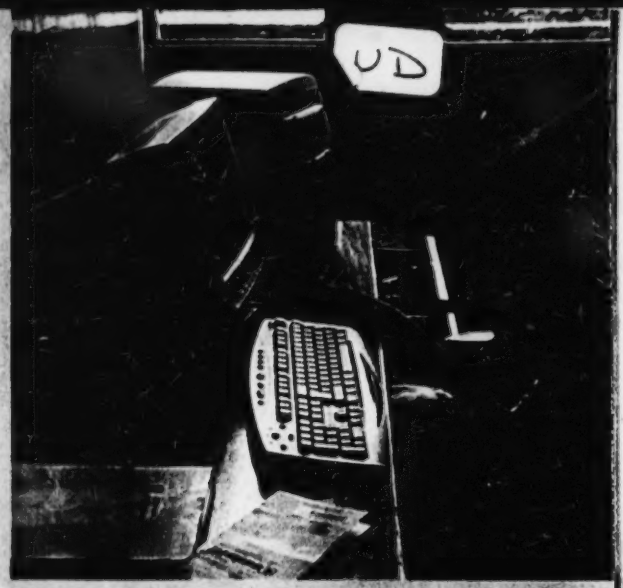
USAID

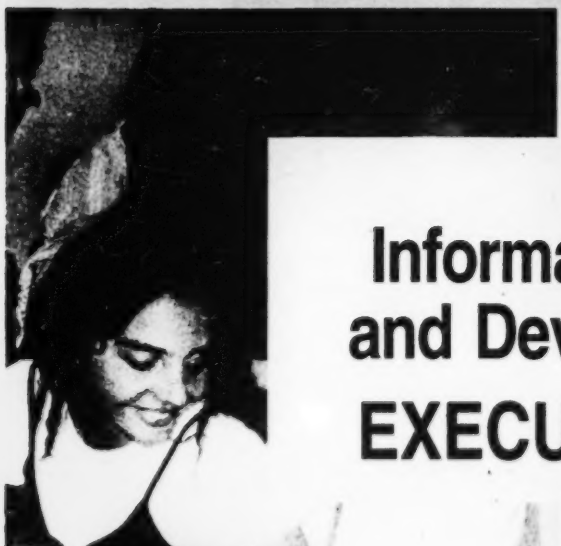
Dr. Anthony Meyer
G/HCD/BEHS
(202) 712-4137
ameyer@usaid.gov

Stephen A. Tourtras
G/HCD/EH
(202) 712-0154
stourtras@usaid.gov

125

BEST COPY AVAILABLE





Gender, Information Technology, and Developing Countries

EXECUTIVE SUMMARY

UD034569

BEST COPY AVAILABLE

126

Gender, Information Technology, and Developing Countries: An Analytic Study

Executive Summary

LearnLink

We must recognize that information technology is here to stay . . .. What we have to decide is whether we...play the game and turn it to our advantage or lose out completely.

Fatma Alloo, Founder of the Tanzania Media Women's Association, in *Women in the Digital Age—Using Communication Technology for Empowerment: A Practical Handbook,* Society for International Development and UNESCO (1998).

BY NANCY HAFKIN AND NANCY TAGGART

Academy for Educational Development (AED) for the Office of Women in Development, Bureau for Global Programs, Field Support and Research, US Agency for International Development (USAID)

BEST COPY AVAILABLE

FOREWORD

To help women and men in developing countries overcome the digital divide, we first need to understand the complex relationship between gender, information technology, and development. How can information technology be used to accelerate development and increase gender equity? Are there barriers to women's entry into the world of information technology? Where are the most persistent barriers to participation? Are there regional differences?

The USAID Office of Women in Development (G/WID) supported the study, "Gender, Information Technology, and Developing Countries," to help answer these questions. This study examines what we do and do not know about the gender dimension of the digital divide. It identifies some of the key barriers to women's participation in information technology, as well as some areas where women already are participating in and benefiting from the use of information technology. Dr. Hafkin and Ms. Taggart have provided a solid foundation for USAID and our colleagues in developed and developing countries as we look for effective ways to address those barriers.

On behalf of USAID's Office of Women in Development, I would like to thank Dr. Anthony Meyer of USAID's Center for Human Capacity Development and Dr. Dennis Foote, Director of the Academy for Educational Development's Learnlink Project, for their cooperation and hard work in producing this study. Recognition also must be given to the pioneering women and men who are expanding the potential of information technology as a tool for economic and social development around the world. It is for these leaders, as well as for those who are not yet a part of the global information society, that we have commissioned this work.

Katherine M. Blakeslee

Katherine M. Blakeslee

Director
Office of Women in Development
U.S. Agency for International Development

This booklet contains an Executive Summary of the USAID-supported report *Gender, Information Technology, and Developing Countries: An Analytic Study.* For more information or to obtain printed copies of the full report or the Executive Summary, please contact USAID's Office of Women in Development (WID), 1300 Pennsylvania Avenue, NW, Washington, DC 20523, USA. An electronic version is available on USAID's WID web site: http://www.usaid.gov/wid/pubs.htm. Both this Executive Summary and the full bound copy also may be obtained from AED/LearnLink, 1875 Connecticut Ave, NW, Washington, DC 20009-5721 or downloaded from http://www.aed.org/learnlink.

INTRODUCTION

Information and communication technology (IT) has become a potent force for transforming social, economic, and political life globally. Yet the uneven distribution of IT within societies and across the globe is resulting in a "digital divide" between those who have access to information resources and those who do not. Most women in developing countries are in the deepest part of the divide, further removed from the information age than the men whose poverty they share. Women's lower levels of literacy and education relative to men, as well as negative attitudes towards girls' achievement in science and mathematics, contribute to the gender dimension of the digital divide. In addition, women across the world enjoy a lower degree of economic security than men and face gender-related constraints on their time and mobility. Without access to information technology, an understanding of its significance, and the ability to use it for social and economic gain, women in the developing world will be further marginalized from the mainstream of their communities, their countries, and the world.

IT presents unique and timely opportunities for women. It promises better economic prospects, fuller political participation, communication with the outside world, easy access to information, and an enhanced ability to acquire education and skills and to transcend social restrictions. IT is especially important to poor women because it can provide increased access to resources, the absence of which defines poverty. Hence, it should be viewed as a tool to facilitate access to a variety of development resources rather than as a competing interest. In the context of communication, transportation, and other constraints of the developing world, IT may be even more important for women in developing countries than it is for women in the developed world who have access to an abundance of alternatives.

However, IT is not a panacea for surmounting the obstacles to women's social, political, and economic development. In the context of globalization and shifts in the structure of the international economy, technology-related changes in manufacturing processes might eliminate women's jobs or put them in new jobs with harsh conditions and low pay. IT is a

> **In Bangladesh, the cost of hooking up to the Internet could feed a family for a year. In the Philippines...an Internet hookup amounting to US$200 is beyond the reach of even the middle class....It is a luxury item for most families, and access to it is work-related.**
>
> Rhona O. Bautista. "Staking Their Claim: Women, Electronic Networking and Training in Asia." in Wendy Harcourt. *Women@Internet: Creating New Cultures in Cyberspace.* London: Zed Books. 1999

powerful tool, but one which is not always used in a positive way. For example, the Internet is already being employed to promote sexual exploitation and trafficking of women. However, anti-trafficking activists are beginning to explore IT as a means of combating sexual exploitation.

IT policy must be informed by a gender perspective while advocates for gender equality, in turn, must be aware of the opportunities and challenges that technology brings. Failure to consider gender issues in the early stages of technology diffusion may unwittingly generate negative effects on women. Even seemingly gender-neutral decisions about infrastructure can impact women's opportunities to use new technologies. The ways in which women's IT access, participation, and leadership are addressed will determine whether information technology empowers women or contributes to their further economic and social marginalization. While information technology is not without risks, the greatest risk for women is in not joining the global information society.

ACCESS AND OBSTACLES

In many developing countries, less than one percent of the population—male or female—has Internet access. Obtaining reliable statistics on women's Internet use in developing countries is difficult because the standard indicators are rarely disaggregated by sex, and the available data are not very reliable or comparable. However, it is clear that the numbers are small and the distribution limited. Available figures indicate that, by region, women constitute 22 percent of all Internet users in Asia, 38 percent of those in Latin America, and six percent of Middle Eastern users. No regional figures by sex are available for Africa. It should be noted that most women Internet users in developing countries are not representative of women in these countries as a whole but, rather, are part of a small, urban, educated elite.

Statistics by country are particularly puzzling because there does not appear to be any correlation between women's Internet usage and expected indicators such as female literacy rate, female GDP per capita, female representation in professional and technical jobs, or gender empowerment. Developing countries with high female Internet use have low overall Internet use. In countries where the Internet is used primarily by an urban elite, women are well represented. But as GDP rises, the overall dominance of men edges the percentage of female use lower.

A series of factors constrain women's access to IT, including literacy and education, language, time, cost, geographical location of facilities, social and cultural norms, and insufficient computer and information management skills.

Table 1: Women's Internet use in selected developing countries and the United States (1)

Country	Women as % of Internet users, 2000	Total women Internet users in '000s	Total no. Internet users in '000s	Internet users as % of total population	Population in '000s	Female prof. & tech. workers % of total	Female literacy rate	Female GDP per capita (US$)	GDI Rank 1/174
U.S.A.(2)	51.1	83,479	170,280,364	60.0	283,800	53.1	99.0	23,540	3
Philippines	51.0	76.5	150.0	0.6	77,726	65.1	94.3	2510	65
South Africa	51.0	645.6	1,266	4.2	42,835	46.7	83.2	4637	84
Brazil	43.0	1,075	2,500	2.1	169,807	63.3	83.9	3813	67
Croatia	42.0	63.0	150.0	4.3	4,672	n/a	96.4	3557	50
Mexico	42.0	567.0	1,350	2.5	98,553	45.2	87.9	4594	48
Estonia	38.0	57.0	150.0	14.1	1,421	66.8	99.0	4236	49
Russian Fed.	38.0	4,560	12,000	1.8	146,861	n/a	98.8	3503	61
Zambia	37.5	1.13	3.0	0.2	9,461	31.9	67.5	753	125
Uganda	31.5	4.73	15.0	0.1	22,167	n/a	35.0	944	131
China	30.4	6,840	22,500	0.7	1,265,530	45.1	74.5	2485	79
India	23.0	115.0	500.0	0.2	983,377	20.5	39.4	902	112
Poland	18.7	295.6	1,581	5.4	38,607	61.2	99.0	5061	40
Belarus	17.5	14.0	80.0	0.1	6,667	38.4	98.5	3909	54
Ethiopia	13.9	0.83	6.0	0.1	58,390	n/a	29.2	349	172
Slovakia	12.0	60.0	500.0	13.0	5,393	59.7	99.0	6366	39
Czech Republic	12.0	48.0	400.0	6.8	10,286	54.1	99.0	7952	34
Senegal	12.0	.90	7.5	0.3	9,723	n/a	24.8	1253	127
Lithuania	10.0	7.0	70.0	2.9	3,600	67.5	99.0	3323	55
Jordan	6.0	3.7	60.8	1.8	4,435	n/a	81.8	1429	n/a
Colombia (3)	n/a	n/a	350.0	0.0	38,581	45.6	90.8	4725	51
Peru	n/a	n/a	200.0	1.5	26,111	39.4	83.7	2335	71
Turkey	n/a	n/a	450.0	2.3	64,567	33	73.9	4681	73
Thailand	n/a	n/a	200.0	1.3	60,037	54.5	92.8	5000	58
Indonesia	n/a	n/a	300.0	0.2	212,942	40.8	79.5	2359	88
Pakistan	n/a	n/a	61.9	0.1	135,135	21.0	25.4	701	116
Vietnam	n/a	n/a	10.0	0.1	76,236	27.6	89.0	1385	91

Basic literacy and numeracy are needed to read and compose simple messages, navigate the Internet, and execute commands in software applications. As women make up nearly two-thirds of the world's illiterates, and one out of every two women in developing countries is illiterate, women are more likely than men to lack the basic literacy and computer skills that would enable them to take advantage of new global communication opportunities.

= Fraser-Abder and J.A. Mehta. "Literacy for all," pp. 201-218. in "Missing Links: Gender Equity in Science and Technology for Development." DRC/INIFEM/IT: 1995.

Mary Fontaine

Women take IT courses at a USAID-launched telecenter in Ghana

Education

The single most important factor for increasing the ability of girls and women to take advantage of IT opportunities is education. This requires interventions at all levels, from literacy through scientific and technological education. To prepare women to enter IT fields, the concentrated efforts of the past 10 years to ensure access to quality basic education for girls should be continued and strengthened, with IT integrated into the programs. Indeed, improving the quality and reach of basic education through IT is increasingly essential to mitigating the gender divide for women in developing countries.

Beyond access to basic education, girls and women must be equipped with skills to prepare them for a range of roles in IT as users, creators, designers, and managers. Therefore, efforts should focus on increasing the number of girls and women studying IT-related subjects in formal schooling and seeking IT training outside of school.

Science and technology education is necessary for women to work in IT as computer programmers, engineers, systems analysts, and designers, yet women's low enrollment in math and science courses impedes participation in these IT fields globally. It is interesting and fortunate, however, that there is a great deal of variation in the percentages of women enrolled in the natural sciences, computer science, and engineering in developing countries. Indeed, evidence suggests that young women in developing countries are not as affected as U.S. women by attitudes that computer science is not an appropriate field for women to enter. For example, recent enrollment statistics indicate that more than 50 percent of students enrolled in natural sciences (including IT) in Argentina, El Salvador, Nicaragua, Panama, the Philippines, and Singapore were women. Women comprise at least 30 percent of university level students in natural sciences in a large number of other developing countries, including Jordan, Mongolia, Jamaica, Sri Lanka, West Bank/Gaza, Lebanon, Oman, Tunisia, Algeria, Brazil, Paraguay, Albania, Armenia, and Bulgaria. (4) The largest proportion of women engineers is found in Central and South America and East and Central Europe. (5) Africa remains the area of greatest concern, however, as African women have the lowest participation rates in the world in science and technology education at all levels.

Infrastructure

Since more women than men live in rural areas, the gender gap in Internet access runs parallel to the rural/urban divide. In rural areas where women comprise 60 percent of the population, the resources and infrastructure for IT often are lacking. (6) Connectivity is typically available only in capital and perhaps secondary cities in developing countries. With their special responsibilities for children and the elderly, however, women may find it more difficult than men to migrate to towns and cities. (7) Therefore, increasing women's access to IT involves increasing the availability of communication in areas where women live. Extension of infrastructure, particularly wireless and satellite communications, to rural and peri-urban areas is crucial to this process. In addition, access efforts should focus on the establishment of common use facilities such as telecenters, community phone shops, and other public places convenient and accessible to women.

Information Stores in Burkino Faso

Boutiques d'information illustrate how IT can bring information to rural women in Burkina Faso. Operated by the Government, the *boutiques* deliver agricultural production and marketing information to rural farmers, with a focus on the information needs of women. Currently running at four sites, the project aims to provide a demand-driven information service with an emphasis on interactivity. The project uses local radio to maximize dissemination.

http://www.iicd.org/projests/docs/60.002

For the poor

To date, most women using IT have come from the educated elite. Yet if poor women in developing countries can overcome the constraints that presently prevent their access, they can use IT to help increase access to resources and exercise fundamental rights. To this end, technological and social solutions must respond to the constraints that currently keep poor women from using IT. Among the most interesting potential solutions are those underway in India, a country that has become a source of innovation for IT applications designed to meet the needs of the poor. These include projects by SEWA, Gyandoot/Dhar, Tarahaat, and the Indian National Dairy Development Board. Unfortunately, while many such efforts have been tested in pilot projects around the world, few have proven to be easily replicable.

Barefoot Managers Online

The Self-Employed Women's Association (SEWA) in India is establishing Technology Information Centres in Gujarat to provide computer awareness training and basic computer skills for their "barefoot managers." The IT capacity of women organizers and leaders will strengthen their members' microenterprises. Electronic networking also is expected to strengthen the connections between the various cooperatives working in different sectors and areas.

ILO, "The information technology revolution: Widening or bridging gender gaps."
http://www.ilo.org/puclic/english/bureau/inf/pkits/wer2001/wer01ch4.htm;
http://www.digitaldivide.org/grants.htm

BEST COPY AVAILABLE

Uses

Aside from upper-income enclaves, home access to a computer and the Internet is uncommon in developing countries. Most women who use IT do so at work, where, already, gender inequities that are well established in other sectors of the labor force are being replicated.

Most women entering the world of IT use it as a tool of production for routine office work, with far fewer women using it as a tool of communication for the creation and exchange of information. Few women are producers of IT, whether as Internet content providers, programmers, or software designers. Moreover, women in both developed and developing countries are conspicuously absent from IT decision-making echelons.

Among women using IT for higher-level communication and product creation purposes, the most prevalent application is networking for political advocacy, often by women's NGOs who adopted IT early on for this purpose. Women in developing countries also use networking to promote their business interests, an area far less developed than that of political activism but representing a possibility for further development.

E-mail is the application of choice among women's organizations and individual women in developing countries, as time and bandwidth constraints make Web use difficult.

In ministries of developing countries, out of 201 senior government officials responsible for IT, only 11 are women (5.5 percent). However, where women are in top positions, they are significant. Women serve as the ministers of communication or telecommunication in three countries (Mali, South Africa, and Colombia) and deputy ministers in six (Angola, Belarus, the Czech Republic, Ghana, the Kyrgyz Republic, and Tanzania). It is notable that there are more women in senior government IT positions in Africa than in any other region.

Compiled from lists of senior government officials using the ITU Global Directory. Geneva, 2001.

THE IMPACT OF "IT" AND GLOBALIZATION ON WOMEN'S WORK

While globalization has significantly impacted women's IT work in developing countries, in general it has not changed gender divisions of labor. In the first phase of industrialization in Asia and Latin America, women found many IT-related jobs in the assembly of electronics. During the last fifteen years, as manufacturing has become more automated, greater technical and cognitive skills are required than in the first phase, and the number of women employed in IT manufacturing has dropped.

While advances in IT are making many women's manufacturing jobs redundant,

BEST COPY AVAILABLE

technology is creating other jobs largely taken by women in the service industries, including information processing, banking, insurance, printing, and publishing, where the skill requirements are higher than in manufacturing. The major employment for women in the service sector is in information processing, particularly data entry. The West Indies and the Philippines were the early leaders in this area, followed by China, India, Singapore, Vietnam, and extending most recently to Ghana and Uganda. Other new jobs are in call centers, in Geographical Information Systems (GIS), and in software development, all of which require higher skill levels than data entry. India and Malaysia have captured the bulk of these jobs, but the job market is expanding to other countries as well, notably Togo and Tanzania.

Although IT is a new field, a "gendered" division of labor is already emerging. In general, women tend to be concentrated in end-user, lower skilled IT jobs related to word processing or data entry, comprising only small percentages of managerial, maintenance, and design personnel in networks, operating systems, or software development.

Within the service sector, for example, the major employment for women is in information processing jobs, the high-tech equivalent of the secretarial positions that women have traditionally held. Globally, these jobs are done almost entirely by women, perhaps because of the association of women with typing. (8) In many cases, the jobs were relocated from developed countries because the comparative wages of women in developing countries were one-sixth to one-twentieth of those for women in developed countries. The going rate for data entry in the Philippines is $4-$6/hour while rates are as low as $1.00/hour are found in Jamaica. Medical transcribers in India earn an average of $1200/annum in comparison to $25,000 or more in the US. (9) Nevertheless, the rates are attractive locally and comparable to those of local white collar workers and professionals. (10)

At the same time, some women are making inroads into higher levels of the IT

In the service industries of banking, finance, and insurance, women are concentrated at the lower and less skilled employment levels. In India, for example, women made up 70 percent of the banking workforce by the middle of the last decade. Women's employment in the telecommunications industry in Malaysia reflects similar percentages. However, they tend to be data entry clerks, computer typists, or tellers. The percentages of women in electronic data processing and in management are low, ranging from one to 12 percent in India.

Swasti Mitter, "Who Benefits?" in *Missing Links: Gender Equity in Science and Technology for Development.* DRC/INIFEM/IT: 1995; Sujata Gothoskar, "Computerization and women's employment in India's banking sector," pp. 150-176, in Mitter and Rowbotham, *Women Encounter Technology,* United Nations University Press, 1995.

workforce, especially in Latin America, East and Central Europe, South and South East Asia, and South Africa. In South Africa, for example, women hold 19 percent of data communications and networking jobs, 18 percent in information systems and information technology management, 39 percent in education, training and development, 36 percent in end user computing, and 36 percent in sales and marketing. In India, women occupy nearly 20 percent of the professional jobs in the software industry, (11) and in Malaysia, women are 30 percent of IT professionals. (12) Women reportedly make up 20 percent of the software industry in Brazil. (13)

A businesswoman visits a USAID-supported telecenter in Benin

While there has been much discussion about "teleworking" or "telecommuting" in developing countries, most of these jobs are actually outsourced and located in commercial areas, not in homes. Interestingly, women have expressed a preference for work near but not in their homes, where work traditionally is low-paying and without benefits and where domestic responsibilities might interfere with work.

ECONOMIC EMPOWERMENT

IT can assist women's economic activities in farming, rural development, trade, business, and industry in a variety of ways. For instance, female farmers could greatly increase productivity with access to information on improved agricultural inputs, weather, markets, new production techniques, and farming technologies. Traders and other entrepreneurs also could benefit from marketing information and the opportunity to disseminate information about their businesses.

While business-to-consumer (B2C) e-commerce has generated a great deal of excitement, entry into the industry can be difficult. Women's handicrafts can find niche markets, but marketing and management skills are needed, and supply and delivery problems must be addressed. Some successful developing country e-businesses have targeted their Diaspora markets, for example, and taken advantage of access to local delivery options. Profitable opportunities also exist for women's small-

In India, hundreds of thousands of small telecommunications businesses have been set up offering public telephones for long distance calls. Established with a capital investment of about $2,500, some 300,000 such shops have been created, employing an estimated 600,000 people. According to the International Labour Organization (ILO), women hold nearly half of these jobs. Although they pay only about $500/year, they have been created at the relatively low cost of $1,250/job. The Indian National Council for Science and Technology is working to expand the services that the shops can offer, including voice mail, email, paging, and Internet access.

S. Ramani, "Internet Kiosks in India." http://www.intech.unu.edu/research/past-research/telewrking-india-444/equity-kiosks-summary.pdf.

scale enterprises in business-to-government (B2G) and business-to-business (B2B) markets, where even small firms can participate in international ventures.

IT-enabled communications businesses offer great potential for women entrepreneurs, following the model of Grameen Phone in Bangladesh, *téléboutiques* (storefronts where telephone, fax, email, and sometimes Internet services are available to the public) in Senegal and Morocco, and phone shops in Ghana. Given high demand and low capital and skill requirements, these businesses are within the reach of many women in developing countries where an enabling environment exists. Availability of credit, particularly in the form of micro-credit and credit for small and medium enterprises, is a necessity for women to enter such businesses.

For employment in core sector IT jobs, women in developing countries need to acquire the skills necessary to move into more technical, cognitively oriented, and higher-paying jobs. Degrees in science and technology are the entry tickets to the higher ends of using and producing IT, but women can master many aspects of computer use and maintenance with significantly less training, much of which is available outside the formal education system.

POLITICAL EMPOWERMENT

IT is a powerful tool to improve governance and strengthen democracy. It is particularly useful for giving a voice to women in developing countries who so frequently have been isolated, invisible, and silent. One way that IT can contribute to the political empowerment of women is as a tool for women's networking and social and political advocacy. Also, IT can be used to strengthen women's participation in the political process, improve the performance of elected women officials, increase women's access to government and

BEST COPY AVAILABLE

its services, and disseminate knowledge. IT is particularly useful for increasing the transparency and accountability of government, an application from which women's advocacy groups already are profiting in countries such as India and Bangladesh.

POLICY

Women's ability to take advantage of IT opportunities is contingent upon enabling social, economic, and telecommunications policies, including those leading to increased educational levels and the extension of communication infrastructure to where women live. To date, developing countries have implemented few concrete policies to promote gender equity in IT. As most developing countries are just beginning to devise national IT policies, however, the time is particularly appropriate for ensuring the inclusion of gender concerns. One way for this to occur is by sensitizing policy-makers to IT issues that affect women. Moreover, out of enlightened self-interest, women in developing countries should involve themselves in IT policy and regulation issues.

Even policies that consider social elements, such as universal access and ensuring the reach of communications to rural areas, will be blind to gender differences if the exercise is treated on the macro level without disaggregating by sex. Without explicit gender analysis and incorporation of the results into policy instruments, it is unlikely that the results will have a positive impact on women. For example, the benefits of IT may bypass women even if their countries develop adequate information infrastructure and service delivery. (14) While awareness of gender issues related to IT is growing, in part through international conferences and literature, presently there are very few places where policies reflect this awareness.

While IT policy and strategy varies considerably from country to country, most policy instruments deal with similar issues. Some of those in which gender concerns are relevant include the following: network architecture and deployment (choice of technology); pricing and tariff issues; licensing issues (ownership and control); strengthening technology innovation (R&D); IT-enabled private sector business development; human resource development for system support; IT labor force participation; data infrastructure; and facilitating access to IT networks, including universal service obligations.

Gender issues should be considered not only in the content of IT policy but also in the process of policy elaboration, implementation, and evaluation. As a means of sensitizing policymakers to these issues, the following table illustrates the differences between a "gender neutral" and an "engendered" approach throughout the policy-making process for universal access.

Table 2: Comparison between gender neutral/engendered policy process for universal access (15)

Policy process steps	"Gender neutral" approach	Engendered approach
Problem definition	Focus on macro statistics such as number and percentrage of households with telephone, average distance to access	Look specifically at telephone penetration by gender, by female-headed households, average time and distance to telephone access, location of phones
Definition of goals and beneficiaries	No specific mention of girls and women	Explicit mention of girls and women, particularly those with low incomes and living in rural areas
Formulation of policy options	Policy to increase number and percentage of households with telephones, promote development of telecenters	Same, but also to increase number of telephones per female-headed household, decrease travel time to access a telephone, locate telecenters easily accessible to women, and promote women as owners and managers
Choice of preferred option	Focus on overall impact	Focus on overall as well as gender-specific impact
Enforcement of new policy	Develop support from consumer-advocate groups, ministerial authorities, and operators	Additionally, develop support from women's organizatations, gender units in policy and regulatory agencies, and grassroots groups involved in communications access
Implementation of policy decision	Define implementation modalities and administer process for compliance	Implementation process should be gender aware. Ensure participation of women's support groups so that implementation achieves goals set forth
Evaluation and monitoring	Process based on baseline statistics and quantitative methods	Based on overeall and sex-disaggregated statistics and goals and qualitative methods of analysis; analysis of not only whether women benefit, but which women do so (class, age. rural/urban location, race)
Termination, renewal, and revision	Decisions based on overall, macro-level impacts	Decision based on overall and gender-specific impacts

CONCLUSION

The Digital Divide has become a central international development concern. Following the Okinawa Summit in August 2000, the Group of Eight nations set up a Digital Opportunities Task Force (DOT Force) to devise ways to eliminate the divide. Moreover, the United Nations places access to IT as the third most important issue facing women globally, after poverty and violence against women.

BEST COPY AVAILABLE

Given the importance and high profile of this issue, the time is right to act to ensure that women in developing countries can enter the information age. IT holds tremendous potential for improving the lives of women and their families, including opportunities for employment, education, political empowerment, access to resources and information, and communication with a world outside the boundaries of home. Yet without deliberate action, women may be left out of the push to narrow the digital divide.

Although most women in the developing world have had little contact with IT to date, it is not too late to get women in on the ground floor of IT policy and infrastructure development in many countries. It is imperative that the gender dimension of the digital divide be considered early in the process of IT diffusion, rather than as a corrective measure after the fact. The early stage of IT development is a critical time to advocate on behalf of universal access, low-cost extension of services to underserved rural areas, and an enabling regulatory environment. Women's access to technology and training is a basic requirement for their participation in the global information economy. A focused and timely effort to provide women and girls with IT education and skills can enable them to compete successfully in the global information economy and play a leadership role in its development.

The opportunities offered by information technology have to be seized deliberately because both the potential benefits and the costs of not doing so are very high. However, it would be a mistake to approach IT solely from the perspective of not leaving women behind. To fully benefit from new technology, women must act as leaders in its development and as agents of change, using technology to accelerate their economic and social progress. If pursued thoughtfully and strategically, IT can position women as global leaders in the mainstream of those seeking development solutions in the information age.

School girls in Brazil working with computers

ENDNOTES

(1) http://www/isp-planet.com; http://www.cnnic.cn/develst/e-cnnic200101.shtml; The Standard, http://www.iyp.org.Internet; http://emarketer.com, 1 Nov. 2000; http://www.nua.ie/surveys, "Webchek: Women now dominate South African Web use," 4 Apr. 2001; http://www.cyberatlas.Internet.com; Michel J. Menou and Nancy Hafkin, "Connectivity in Africa: use, benefits, and constraints of electronic communications, Synthesis Report-part 2: overview of the project findings." http://www.bellanet.org/partners/aisi/prof/findings.htm; http://cneng.netvalue.com/news/index.htm; ITU, Telecommunications Indicators, 1998; U.S. Bureau of the Census, World Population Profile: 1988, Table A-4, Population by Region and Country, Washington, D.C.: US Government Printing Office, 1999; UNDP, Human Development Report. New York: United Nations Development Programme, 1999 (for gender-related development index, female literacy, and GDP per capita indices.

(2) U.S. women's Internet usage and total home Internet access data are from http://www.nielsennetratings.com/, 12 February 2001, and http://www.nua.com/surveys, 12 March 2001. U.S. population figures are from U.S. Census Bureau, Population Division, based on census data released 28 December 2000.

(3) Seven countries are shown on the attached table for which there are no data available on women users. Data are shown for these countries because they have been identified as among the 20 largest potential Internet growth areas—where governments have made commitments to telecommunications and the Internet as tools of economic growth and where usage is increasing rapidly (http://www.interactiveweek.com, 29 September 1997). It will be interesting to watch women's use of the Internet in these countries.

(4) UNESCO, Statistical Yearbook 1999.

(5) http://qstgateway.wigsat.org/TA/ed/whyeduc.html. AAUW, Tech Savvy: Educating Girls in the New Computer Age: NUA Internet Surveys, 18 July 2000, "AAUW: Girls Turned Off by 'Nerdy' Image of Information Technology," http://www.nua.ie/surveys/qasat/papers/ngp.htm; Rathgeber, "Schooling for What?" in *Missing Links: Gender Equity in Science and Technology for Development.* (IDRC/INIFEM/IT: 1995).

(6) International Telecommunication Union Task Force on Gender Issues, 2000.

(7) UNIFEM and UNU/INTECH. "Gender and Telecommunications: An Agenda for Policy," 2000. http://www.unifem.undp.org/conferen.htm. In Ethiopia, 20 hours of

access per month costs $77 (including local phone costs) while per-capita income is estimated at $110/year.

(8) U.S. Congress study of office automation, cited in Ruth Pearson, "Gender perspectives on health and safety in information processing," p. 279 in Mitter and Rowbothan, *Women Encounter Technology*.

(9) Swasti Mitter, "Teleporting and Toleration in India: Combining Diverse Perspectives and Visions," *Economic and Political Weekly*, 24 June 2000, p. 2247.

(10) Mitter, *"Who Benefits?" in Missing Links*, p. 234.

(11) Mitter, "Teleworking and Teletrade in India," loc. cit.; *Teleworking and Development in Malaysia, Vol. I Integrated Report.* United Nations University/Institute for New Technologies Policy Research Project in partnership with MIMOS Bhd. and UNDP, April 1999, p. 2247.

(12) Ng, "Teleworking and Gender in the Information Age: New Opportunities for Malaysian Women?" http://gendevtech.ait.ac.th/gasat/papers/ngp.htm, p. 6.

(13) UNIFEM and UNU/INTECH. "Gender and Telecommunications: An Agenda for Policy," 2000. http://www.unifem.undp.org/conferen.htm.

(14) Gillian Marcelle, "Getting Gender into African IT Policy: A Strategic View," pp. 48-49 in Rathgeber and Ofwona, *Gender and the Information Revolution in Africa*.

(15) Adapted from Sonia Nunes Jorge, "Gender Perspectives in Telecommunications Policy: A Curriculum Proposal." Report of Working Group I. Third Meeting of the Task Force on Gender Issues, ITU, Geneva, 9-10 October 2000. Document TFGI 3/4 E. http://www7.itu.int/treg/Events/Seminars/2000/Symposium/English/document26.pdf.

BEST COPY AVAILABLE

Summer 2001

LearnLink is a six-year, Indefinite Quantities Contract (No. HNE-I-00-96-00018-00) of the U.S. Agency for International Development (USAID). It is funded by the Human Capacity Development Center in the USAID Global Bureau and other USAID Bureaus, offices, and missions. It is operated by the Academy for Educational Development (AED).

For additional information contact:

Dr. Dennis Foote
Project Director
(202) 884-8708
dfoote@aed.org

Steven Dorsey
Deputy Director
(202) 884-8724
sdorsey@aed.org

AED

LearnLink Project, AED
1825 Connecticut Avenue, N.W.
Washington, DC 20009
Fax: (202) 884-8979
Email: learnlink@aed.org
www.aed.org/learnlink

USAID

Dr. Anthony Meyer
G/HCD/BEIS
(202) 712-4137
ameyer@usaid.gov

Stephen A. Tourlentes
G/HCD/EI
(202) 712-0154
stourlentes@usaid.gov

BEST COPY AVAILABLE